

IUPAC
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY
UNION INTERNATIONALE DE CHIMIE PURE ET APPLIQUÉE



COMPTES RENDUS XXVI CONFERENCE

WASHINGTON, DC
15—24 July 1971

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UNION INTERNATIONALE DE CHIMIE PURE ET APPLIQUÉE



COMPTES RENDUS XXVI CONFERENCE

WASHINGTON, DC

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International Union of Pure and Applied Chemistry
1972

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*These Delegates have the status of Observer and they are not entitled to vote.

AGENDA FOR XXVIth COUNCIL MEETING

Washington, DC, 21 and 23 July 1971

1. Finalization of Agenda
2. Approval of Minutes of XXVth Council Meeting
3. Announcement of Nominations for Officers and Bureau Members
4. Announcement of Time of Elections
5. Statutory Report of President on State of the Union
6. Biennial Report of Treasurer
7. Report of Finance Committee
8. National Adhering Organizations: Applications and Changes of Category
9. Applications for Associated Organization Status
10. Tentative Budgets for 1972 and 1973
11. Dues Structure
12. Fixing Annual Dues for 1972 and 1973
13. Reports of Division Presidents and Clinical Chemistry Section
14. Report of Committee on Teaching of Chemistry
15. Report on Publications
16. Adoption of Tentative and Final Nomenclature Rules
17. Bureau Proposals for New Units
18. Ratification of Decisions taken by Bureau and Executive Committee since XXVth Conference
19. Location of Official Headquarters for Next Four Years (Statute 4.3)
20. Language for Official Records for Next Four Years (Statute 5.405)
21. Elections
22. Ratification of Dates and Place of XXVIIth Conference and XXIVth Congress
23. Place of XXVIIIth Conference and XXVth Congress
24. Any Other Business (Discussion only)

REPORT OF PRESIDENT ON STATE OF THE UNION

IUPAC 1969—71

Throughout the entire history of IUPAC its governing bodies have been confronted with the problems generated by the expansion of chemical science. The almost explosive growth that we have witnessed in the past few years has produced many critical problems for IUPAC, as it has also for ICSU and other scientific Unions, so that intensive and imaginative forward planning is essential. In a nongovernmental international organization such as IUPAC any increase of activity to meet expanding responsibilities must draw on the honorary and dedicated services of the many chemists throughout the world who are prepared to work for the benefit not only of their fellow chemists, but also of chemistry, industry, and the human community without recompense. However, effective work cannot be achieved entirely by correspondence; convening committees for one purpose or another involves expenditure of IUPAC funds in spite of the generous travel and subsistence support that IUPAC receives from Adhering Organizations and the employers of many of the scientists on these committees. As the Treasurer will no doubt tell you, increased activity can be supported only by increased income. This is a problem common to all nongovernmental organizations; IUPAC, through the wise and provident actions of its Treasurers and the Finance Committee, has been better able to meet the demands of expanding activity, but its reserves are limited and other resources must be found. IUPAC has made great strides in ensuring continuity of income, but ultimately, like other nongovernmental bodies, it must rely more and more on governmental recognition of the importance of nongovernmental organizations; governments must be prepared to support them on a continuous funding basis. The problem is how to convince national governments of the contribution to national economic development, to education, to communal welfare, and to the future of human society by the work of nongovernmental organizations. Ultimately, this devolves on the 43 National Adhering Organizations, but the evidence must be supplied by the nongovernmental international organizations themselves. For IUPAC's part, I believe a convincing case for support could be assembled from past and current activities and I hope that steps will be taken in the immediate future to construct such a case and increase this source of income.

The development of science has brought with it the parallel creation of self-contained inter- and multi-disciplinary groups. The central nature of chemistry has meant that IUPAC has been confronted with many inter-disciplinary problems, to which an *ad hoc* Committee under the Chairmanship of Prof. J. BÉNARD (France) has addressed itself since our last Conference. This Committee recommended the improvement of relationships with the Associated Organizations of IUPAC, to the extent of statutory change if necessary, the conduct of surveys of the objects and activities of nonIUPAC bodies, both members of ICSU and others with which IUPAC should establish working liaison, and a study of the future interdisciplinary contacts which IUPAC should establish. Most of these proposals are in hand. At present there are 4 Associated Organizations and several applications are currently being considered. Joint activity has been established along sound lines with the International Union of Biochemistry and a satisfactory working agreement has been negotiated with the International Federation of Clinical Chemistry. The main purpose of these working liaisons is to avoid the

promulgation of conflicting recommendations in those matters that require international regulation and agreement, such as nomenclature, units, symbols, terminology, and standards. Closer relationships with the International Union of Pure and Applied Physics, with which IUPAC has long enjoyed cordial working relations in specific areas, are being promoted through contact at the Presidential level. IUPAC is represented, either by statute or invitation, on many other international and regional organizations; these are now on a more formal basis and representation is reviewed annually. Several international and regional governmental agencies have long relied on IUPAC for advice on their chemical problems. Where these requests go beyond the normal programme of the relevant IUPAC Commission, your Bureau has entered into contracts through which the work is supported financially. Contracts with the European Economic Community and UNESCO have allowed IUPAC to undertake additional work on analytical methods and chemical education, respectively.

At the last Conference Dr. R. W. CAIRNS (USA) remarked on the unsatisfactory position of applied chemistry in IUPAC, as a result of which the Executive Committee established an *ad hoc* Committee to review the problem and to report to the Bureau at its meeting in Vienna in October 1970. The valuable study by this Committee has led to proposals for the increased involvement of chemists from industry in IUPAC activities and a rationalization of the work and function of the Applied Chemistry Division. On the other hand, I doubt if chemical industry throughout the world recognizes the extent to which it depends on the honorary work performed by IUPAC's Divisions and Commissions over the years. While the support for the Company Associates Scheme in some countries has been excellent I would urge all National Adhering Organizations to promote this activity vigorously to contribute to the financial support which IUPAC's work demands.

There has been tremendous scientific activity in IUPAC over the past few years, which I am sure is directly attributable to the stimulation of Commission activity by my three distinguished predecessors, Lord TODD, Prof. W. KLEMM, and Prof. V. N. KONDRATIEV. The evidence for this enhanced activity is to be found in the publications programme, which has been so ably developed and guided by the Committee on Publications under the Chairmanship of Sir HAROLD THOMPSON (UK). Not only have we witnessed a substantial expansion of our journal, *Pure and Applied Chemistry*, with additional tabulated material, symposium proceedings and monographs appearing as supplements, but also the inauguration of two series of supplements to the *Bulletin* designed to make reports and recommendations rapidly available to specialists throughout the world for comment. These supplements are (i) Appendices on Tentative Nomenclature, Symbols, Units, and Standards, and (ii) Technical Reports. They have been well received in the chemical world. One extraordinarily successful publication, the report by Prof. KLEMM on IUPAC activity in the period 1957-67, had to be reprinted within 6 months of its release. It is perhaps to some extent fortuitous, but nevertheless significant, that the long and dedicated work of the Nomenclature Commissions has seen the publication of revised editions of the Red Book (*Nomenclature of Inorganic Chemistry*), the Blue Book (*Nomenclature of Organic Chemistry*), and the Green Book (*Manual of Symbols and Terminology for Physicochemical Quantities and Units*) since our last Conference. This is the summation of great and important work by IUPAC. It is, I understand, to be followed shortly by the publication of a parallel volume of recommendations from the Analytical Chemistry Division. The IUB-IUPAC Commission on Biochemical Nomenclature has also been particularly active,

notably in the revision of enzyme nomenclature. Even a cursory review of IUPAC's work in chemical nomenclature cannot fail to reveal the name of Prof. P. E. VERKADE (Netherlands), who has been active in IUPAC affairs since 1922. All the chemists of this world, both academic and industrial, and for that matter, the human community that has derived great benefit from chemistry, owe an extraordinary debt of gratitude to Professor VERKADE.

We are all aware that there has been, throughout the community and among scientists particularly, a rapidly developing concern over problems of the human environment. In ICSU this has culminated in the establishment of a Special Committee on Problems of the Environment (SCOPE), which has made a very impressive start in its formulation of the problems and its analysis of such scientific investigations as is necessary to combat the progressive deterioration of the environment. Dr. W. GALLAY (Canada) represents IUPAC on SCOPE, and Prof. R. TRUHAUT (France) is an additional member nominated by ICSU. At Cortina d'Ampezzo in 1969 the Bureau established an *ad hoc* Committee, consisting of Dr. W. GALLAY (Canada) and Prof. P. W. WEST (USA), to advise the Bureau on problems of the human environment, and named a panel of individuals from various areas of IUPAC expertise, which was submitted to ICSU to assist SCOPE in establishing its various Commissions. IUPAC has a long history of consideration of and action in problems of the environment. From the very beginning it was concerned with industrial hygiene, and certainly had very active Commissions working on problems of industrial hygiene and food chemistry from the early 1920's. A great deal of attention was given to the establishment of acceptable methods for estimating the concentration of pollutants and toxic substances; industrial effluents, specifically gases, industrial waste water, and dusts from various industries, were closely investigated and recommendations made for their measurement and control. At the same time a parallel Commission was actively concerned with food chemistry and the effects of various additives in food.

This concern by IUPAC has continued through to the present day, although the nature of the problems has changed to some extent and the organization of the work been modified. In 1947, for example, a Commission on the Toxicology of Atmospheric Pollution was created, and this addressed itself to the problems of the methods of estimation of toxic vapours, gases, and dusts. Early in the 1950's an independent Commission was established to deal with the problems of industrial water, and at the present time active collaboration with the ICSU Scientific Committee on Water Research (COWAR) and the International Association on Water Pollution Research (IAWPR) is being developed. In the late 1950's food additives became the subject of an independent Commission, and at about the same time the increasing anxiety about pesticides and pesticide residues demanded specific attention. The work that these various groups have done over the years, and particularly during the last 10 years, represents a substantial contribution to the solution of these problems from IUPAC. This concern for environmental problems throughout the whole history of IUPAC does not seem to be very well known, particularly among colleagues from the biological and environmental sciences. Certainly, in any programme inaugurated by SCOPE, chemistry must play a significant and even central role. Throughout the years many of the IUPAC groups concerned with problems of food and food additives, pesticides and their residues, and toxicology have stood in a consultative capacity to the UN agencies and to national member governments. In this regard it is interesting to recall that the International Congresses on Applied Chemistry (one of the precursors of IUPAC) established an International Commission for Analysis in 1906.

This Commission convened conferences in Paris in 1910 and 1912 to study means for achieving uniform methods of analysis of food products for human and animal consumption and of industrial products. It pressed for the establishment of a permanent international bureau of analytical chemistry to concern itself with these matters and persuaded national governments to support the proposal, but the 1914-18 World War intervened. The Ist Conference of IUPAC in Rome (1920) reopened the discussion and immediately established a working party directed at these problems. Again, the XIIth IUPAC Conference, held in Switzerland in 1936, resolved that the Xth Congress on Pure and Applied Chemistry should be directed to topics concerned with the quality of human life, specifically food and health.

IUPAC's role in promoting chemistry has been fulfilled in the sponsorship, both with and without financial support, of an increasingly large number of international and regional symposia and conferences. Since the last Conference in Cortina d'Ampezzo some 36 scientific meetings have been held under IUPAC sponsorship and many have generated important publications in *Pure and Applied Chemistry*. The XXIIInd Congress of Pure and Applied Chemistry was held in Sydney, Australia, in August 1969, in conjunction with the XIIth International Conference on Coordination Chemistry. The meeting was attended by some 1,400 participants, and was undoubtedly a successful scientific event. Great credit must be given to Dr. J. R. PRICE, Chairman of the Organizing Committee, and his many associates for the success of that Congress. We look forward keenly to the XXIIIrd Congress in Boston next week, which has a programme of scientific events that will undoubtedly make a significant and lasting impression on the development of chemistry.

All chemists are, of course, familiar with the enormous problems created by the rapid development of the scientific literature, and the dependence of further development of science on the adaptation of computer techniques to these problems. In Prof. KONDRATIEV's Presidency an *ad hoc* Committee under the chairmanship of Dr. B. RIEGEL (USA) surveyed the problems of chemical documentation and submitted a most valuable report on the matter to the Bureau. As a result of this report an Inter-Divisional Committee on Machine Documentation in the Chemical Field was appointed; this Committee has now become actively concerned with the problems assigned to it in its terms of reference. Other new units established at the Cortina Conference have been active during the past 2 years, particularly the Section on Medicinal Chemistry under the Chairmanship of Prof. E. CAMPAIGNE (USA). The very progressive proposal for an International Centre for Analytical Chemistry has been investigated in great detail by a Committee under the Chairmanship of Prof. H. MALISSA (Austria) and the proposal has generated strong support from various bodies outside IUPAC. In Vienna last year the Bureau recorded its conviction of the desirability of establishing such a Centre, but was disturbed by the financial implications and constituted a new Committee to look into this particular aspect. The Committee will report to the Bureau on this aspect of the proposal during this Conference. As at present formulated the proposed Centre would act as a coordinating focus for experimental problems conducted in analytical chemistry institutes throughout the world; if the proposal does come to fruition it would provide greatly needed assistance in coordinating analytical standards at national levels and in areas peripheral to chemistry, e.g., clinical chemistry.

IUPAC has continued to study the problems of education in chemistry, with the assistance of a grant from UNESCO, through the Committee on the Teaching of Chemistry, under the Chairmanship of Prof. R. W. PARRY (USA). Throughout the years this Committee has made extraordinarily

valuable contributions to the solution of these problems, and during the last 2 years has joined with national bodies in Italy and USA, in conferences on various aspects of chemical education. During this XXVIth Conference it is making a very determined attempt to involve National Representatives, concerned with educational problems, in a discussion of in-service training at the secondary school level.

Although the finances of the Union are handled by the Treasurer on behalf of Council and will be reported on shortly, it would be remiss of me not to mention the enormous contribution made to the Union's operations by the Finance Committee, until recently under the Chairmanship of Mr. P. M. ARNOLD (USA). The Finance Committee is an advisory body, which reports to the Executive Committee and Bureau on matters referred to it. It has, of course, a regular advisory role in relation to the budget, the accounts, the Union's investments, and the general question of sources of income, which includes consideration of membership and membership dues. The Finance Committee has made recommendations to the Bureau on membership dues, which have been discussed by Council at previous Conferences; further recommendations in this regard are being submitted to Council during this Conference. The Finance Committee's work in the establishment and promotion of the Company Associates Scheme has been of immense value to IUPAC and has allowed the establishment of the Executive Secretariat, through which it has been possible to service the rapidly expanding programmes of activity in the various Committees and Commissions. Mr. ARNOLD's contribution to the Union during his period of 8 years as Chairman of the Finance Committee has been invaluable. As members of this Council are aware, his efforts have always been dedicated to the development of the Union. Dr. J. W. BARRETT (UK), who has had a long association with IUPAC, has been appointed by the Executive Committee to succeed Mr. ARNOLD in this Office.

It has become increasingly clear during the past few years that our Statutes and By-Laws need review and revision in some respects at least. An *ad hoc* Committee under the chairmanship of Sir DAVID MARTIN (UK) has considered the problem and it is hoped that Council will agree to the establishment of a Standing Committee on Statutes and By-Laws, which can undertake this review, recommend such changes as are necessary, and act as a point of reference in the future for matters of interpretation.

It is not often that the Union can hold its Conference outside Western Europe, which is the most economic venue, but we have been able to accept the US National Adhering Organization's invitation to hold this XXVIth Conference in Washington because our US colleagues have generously contributed \$50,000 towards the additional cost. I am sure Council would wish me to express to our hosts appreciation of their generosity and hospitality, and also of the considerable assistance given to the Secretariat in organizing these meetings. I would ask Dr. B. RIEGEL, Chairman of the US National Committee for IUPAC, to convey to his Committee and to the National Academy of Sciences our appreciation and thanks.

On the more personal side I wish to thank the Members of the Bureau, of the Executive Committee, and of the various Committees attached to the Bureau for their friendly cooperation and assistance in furthering the objects of IUPAC and, through the Division Presidents, the Members of Division Committees, Sections, and Commissions, for the fruitful work that they have so willingly performed during the last 2 years.

You are all aware of the valuable contribution that the Executive Secretary and his staff have made to the Union's work, but I would like to express my own sincere thanks to them for their valued and efficient work.

The Officers of the Union inevitably carry a heavy burden of responsibility and work. In particular, the Secretary General, Dr. R. MORF, and the Treasurer, Prof. J. C. BAILAR, Jr., have continued to work tirelessly for the Union; they both deserve the greatest thanks for their tremendous contributions to the Union and to chemistry throughout their long periods of service. In conveying this tribute to them I wish to add my own thanks for all their cooperation and assistance during my term of office.

It is sad that our immediate Past-President, Prof. V. N. KONDRATIEV, leaves the governing bodies of IUPAC at the conclusion of this Council meeting. Tributes to his distinguished contributions to IUPAC have been made on earlier occasions, but I could not let this occasion pass without reaffirming Council's appreciation and wishing him many years of rewarding, healthy, and happy life.

Prof. J. BÉNARD assumes office as President of IUPAC at the conclusion of this Council Meeting. This is the second occasion only on which our President has been a Frenchman—Prof. C. MOUREU was the first IUPAC President (1919-22)—but for 36 years France provided our Secretaries General. Prof. BÉNARD is an inorganic chemist of great distinction, who has quietly and modestly worked for IUPAC for many years. His wisdom and understanding have contributed decisively in resolving many important issues and his friendly advice and cooperation have been of the greatest assistance to me. I can assure you that Prof. BÉNARD will be an excellent President, who will place the welfare of IUPAC above all else. We wish him outstanding success in the Presidential office.

A. L. G. REES
President

BIENNIAL REPORT OF TREASURER FOR 1969—70

The activities of the International Union of Pure and Applied Chemistry continue to expand. At the 1969 Conference in Cortina d'Ampezzo, several new units and new functions were established — an Inter-Divisional Committee on Machine Documentation in the Chemical Field, a Sub-Commission on Plasma Chemistry, a Commission on Organic Photochemistry, and a Section on Medicinal Chemistry. All such functions, of course, require funding, which puts an added strain on the already overburdened treasury of the Union. It has been our philosophy, however, that as long as the Union continues to do useful and important work, the necessary money will be forthcoming, so we have had no hesitation in establishing new, worthwhile programmes. It must be admitted, however, that money does not come of its own accord — someone has to ask for it, and to urge potential donors to contribute. Thus far, the finances of the Union have been kept in good condition, but the Treasurer wishes to call attention to the fact that the income of the Union has increased very little during the biennium just ended. With constantly increasing costs, both because of newly undertaken activities and inflation, new sources of funds must be found.

The Finance Committee has worked very hard on changes in the dues structure of the Union and will present a plan for such a change at this Conference. It has attempted to eliminate the objections to earlier versions of the proposed dues structure, and it is greatly to be hoped that Council will accept the new proposal. Mr. P. M. ARNOLD, who has been Chairman of the Finance Committee for the past 8 years, has spent a great deal of time and effort on this problem, and he deserves the thanks of all of us.

The Company Associates scheme is working well, and has brought in a good deal of money — over \$57,000 in 1970. All of this money came from 10 countries (Belgium, Czechoslovakia, Germany, Greece, Italy, Japan, Portugal, Republic of South Africa, United Kingdom, and United States of America). These countries represent less than a quarter of those which belong to the Union. The Secretariat has been in contact with National Adhering Organizations in several countries that are not represented, but, if we hope for real success, the Delegates to the Council, the Members of the Commissions, and the National Adhering Organizations must take the lead in soliciting new Company Associates. I urge that all of you do what you can to build up our Company Associates list, and to urge the larger industrial organizations to subscribe for increasing numbers of units.

The Company Associates scheme is much more than a means of increasing the revenue of the Union — it furnishes a valuable link between IUPAC and the chemical industry — a link which we have tried to strengthen for several years. Each Company Associate receives the IUPAC journal *Pure and Applied Chemistry*, the *Information Bulletin* and its Appendices, and advance notices of IUPAC-sponsored symposia and conferences. The cost of these services must be deducted from the income which the Company Associates contribute and, actually, takes more than half of those contributions. Companies which subscribe for more than 1 unit may have equivalent numbers of IUPAC publications and other documentation, and many have asked for them. The Bureau has ruled that, starting in 1972, the Company Associates must pay one-half of the subscription cost to *Pure and Applied Chemistry*. Clearly, this will make each Company reassess the value of this

journal to them. Hopefully, it will make them appreciate the journal more fully, and will decrease costs to the Union without driving away Company Associates. Let me call your attention again to the fact that each Adhering Organization may retain 5% of the money collected from the Company Associates in its country to further the Company Associates programme. The US National Committee has recently held a meeting to which all Company Associates in the United States were invited to send representatives to learn what IUPAC is doing, and how they might become more involved and influential in its work. Although the attendance was small, the meeting accomplished its purpose, and should bring the Union suggestions for improving its service to the chemical industry.

During the past biennium, the Academy of Sciences of USSR has advanced from Category A1 to Category A3. We are thankful for this change, and hope that other Adhering Organizations will also find it possible to move to higher categories.

Financial help comes to IUPAC from many sources — some of them not apparent to casual observation. For example, most of the Officers of the Union and Members of its Committees and Commissions are able to call on their employers for stenographic help and office supplies and equipment. Most of the individual items are small, but some are large. All together, they amount to many thousands of dollars each year. While it would be difficult, if not impossible, to send thanks to the universities and industrial organizations that so contribute, we are quite conscious of their help, and grateful for it.

France, Germany, and United Kingdom volunteered to pay part of the expenses of their Titular Members to the biennial Conference which was held in Cortina d'Ampezzo. This, too, is a great help, and we express our thanks to them.

Another source of financial aid comes from royalties on our publications made through Messrs. Butterworths.

Our contract with UNESCO (on the teaching of chemistry) does not result in a net financial gain to the Union, for all of the money received is spent on each specific project. However, IUPAC is contributing in important ways to international chemistry through this contract. On the other hand, our contract with the European Economic Community is profitable to us, for it carries payment to the Union, but the work for which we are thus paid is contributed by IUPAC Members. We are grateful to them for this help.

We must again express our thanks to Schweizerische Bankgesellschaft, which has handled our accounts for many years. Our fee to them certainly does not pay for the excellent service which the Bank gives us. We would thank particularly Mr. H. BAUMANN, who has charge of the IUPAC account, and Dr. J. RAKOWSKY, who labours diligently on our behalf.

The year 1971 will be a very expensive one for IUPAC — partly because of the increased activities of the Union and partly because of inflation, but chiefly because the Conference is to be held in Washington, DC. Costs there are high. Also, although North America is well represented on IUPAC bodies, most of the Officers and Titular Members live in Europe, and their transportation to America is a large item in our budget. Mr. R. RATCLIFFE, in the Secretariat, has done valiant work in arranging group flights from Europe to America for our Titular Members. This will save a great deal of money for us, and we are grateful to Mr. RATCLIFFE for his imaginative work.

Although travel costs account for most of IUPAC's expenditures, we feel that it is important to have Titular Members from all parts of the world. We rejoice that increasing numbers of them are coming from the Eastern

Hemisphere. We trust that before long, the Southern Hemisphere will be equally well represented.

The exact figures relating to Income and Expenditure Accounts, and the Balance Sheet, can be seen in the report of the Auditors, which is in the following pages.

J. C. BAILAR, Jr.
Treasurer

*To the Executive Committee
International Union of Pure and Applied Chemistry
Zürich—Switzerland*

AUDITORS' REPORT ON ACCOUNTS

Years ended 31 December 1969 and 1970

We have examined the Balance Sheets of the International Union of Pure and Applied Chemistry as at 31 December 1969 and 1970 as well as the related Statements of Income and Expenditures for the two years then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the enclosed Balance Sheets and Statements of Income and Expenditures together with the return of supplementary information present fairly the financial position of the International Union of Pure and Applied Chemistry as at 31 December 1969 and 1970, and the results of its operations for the two years then ended, in conformity with generally accepted accounting principles.

Neutra Auditing Inc.

INCOME OF IUPAC FROM NATIONAL ADHERING ORGANIZATIONS IN 1970

Country				Category				Annual Subscription
								\$
Argentina	..	..	..	C	..	..	..	450
Australia	..	..	..	A1	..	..	..	2,600
Austria	..	..	..	C	..	..	..	450
Belgium	..	..	..	A1	..	..	..	2,600
Brazil	..	..	..	C	..	..	..	450
Bulgaria	..	..	..	C	..	..	..	450
Canada	..	..	..	A2	..	..	..	5,000
Colombia	..	..	..	C	..	..	..	450
Cuba	..	..	..	D	..	..	..	100
Czechoslovakia	..	..	..	B1	..	..	..	800
Denmark	..	..	..	A1	..	..	..	2,600
Finland	..	..	..	B1	..	..	..	800
France	..	..	..	A2	..	..	..	5,000
Germany	..	..	..	A3	..	..	..	10,000
Greece	..	..	..	D	..	..	..	100
Hungary	..	..	..	C	..	..	..	450
India	..	..	..	B2	..	..	..	1,600
Ireland	..	..	..	D	..	..	..	100
Israel	..	..	..	B1	..	..	..	800
Italy	..	..	..	A2	..	..	..	5,000
Japan	..	..	..	A2	..	..	..	5,000
Mexico	..	..	..	C	..	..	..	450
Netherlands	..	..	..	A1	..	..	..	2,600
New Zealand	..	..	..	C	..	..	..	450
Nigeria	..	..	..	D	..	..	..	100
Norway	..	..	..	B1	..	..	..	800
Poland	..	..	..	B1	..	..	..	800
Portugal	..	..	..	C	..	..	..	450
Republic of China	..	..	..	B1	..	..	..	800
Republic of Korea	..	..	..	C	..	..	..	450
Republic of South Africa	..	..	..	B1	..	..	..	800
Republic of Vietnam	..	..	..	C	..	..	..	450
Romania	..	..	..	B1	..	..	..	800
Spain	..	..	..	B1	..	..	..	800
Sweden	..	..	..	A2	..	..	..	5,000
Switzerland	..	..	..	A1	..	..	..	2,600
Turkey	..	..	..	D	..	..	..	100
United Arab Republic	..	..	..	C	..	..	..	450
United Kingdom	..	..	..	A3	..	..	..	10,000
USA	..	..	..	A4	..	..	..	25,000
USSR	..	..	..	A3	..	..	..	10,000
Venezuela	..	..	..	D	..	..	..	100
Yugoslavia	..	..	..	C	..	..	..	450

COMPARATIVE BALANCE SHEETS

(Expressed in

Assets

	1969	1970
Cash in Bank	18,587.37	34,613.03
Bankers Acceptances	40,000.00	65,000.00
Bullion Account—at cost	14,176.45	0.00
Marketable Securities—at cost	193,516.27	190,738.41
Other Assets	250.00	5,879.24

US-\$ 266,530.09 296,230.68

Note: Subscriptions outstanding as at 31 December 1970 US-\$ 7,100.00

COMPARATIVE STATEMENTS OF INCOME AND

(Expressed in

Income

	1969	1970
<i>Subscriptions</i>		
Current Year	86,681.95	101,381.80
Previous Years	<u>2,197.95</u>	<u>13,048.50</u>
	88,879.90	114,430.30
<i>Company Associates</i>	36,000.10	57,676.27
<i>Interest and Dividends Earned</i>	12,136.98	12,234.87
<i>Royalties from Butterworths</i>	10,184.50	9,700.03
<i>Other Income</i>		
American Chemical Society— Petroleum Research Fund (5,000.00) and C. & H. Dreyfuss Foundation (6,500.00) in favour of Frascati Conference	11,500.00	0.00
Contract Teaching of Chem- istry (UNESCO special subvention)	3,000.00	7,500.00
CEE Brussels	0.00	7,121.10
Gesellschaft Deutscher Chem- iker (special subvention)	5,000.00	0.00
Farbenfabriken Bayer AG in favour of IUPAC Photo- symposium	0.00	275.70
Reimbursement of contribu- tion 1968 and 1969 paid to ICSU	1,890.68	2,199.22
Income by IUPAC Secretariat (sales of publications, etc.)	<u>1,013.75</u>	<u>1,078.17</u>
	22,404.43	18,174.19
<i>Exchange Differences</i>	177.59	27.00
<i>Excess of Expenses over Receipts</i>	59,302.76	0.00
	<u>229,086.26</u>	<u>212,242.66</u>

UNESCO/ICSU GRANT ACCOUNT

Subvention collected during year	14,000.00	18,000.00
US-\$	<u>243,086.26</u>	US-\$ <u>230,242.66</u>

AS AT 31 DECEMBER 1969 AND 1970

US-Dollars)

Liabilities and Net Worth

	1969	1970
Accrued Liabilities	4,416.72	922.46
Net Worth:		
Capital Account	107,926.36	107,926.36
Reserve	213,489.77	151,123.99
	<u>321,416.13</u>	<u>259,050.35</u>
Excess of Receipts over Expenses 1970		36,257.87
Excess of Expenses over Receipts 1969	(59,302.76)	
	262,113.37	295,308.22
US-\$	<u>266,530.09</u>	<u>296,230.68</u>

EXPENDITURES—YEARS ENDED 31 DECEMBER 1969 AND 1970

US-Dollars)

Expenditure

	1969	1970
<i>Office Expenses</i>		
(salaries, printing, stationery, etc.)		
General Office and Divisions	9,356.04	8,291.46
Office of Secretary General (Zürich)	12,076.40	10,232.05
IUPAC Secretariat (Oxford)	42,979.35	54,068.90
	<u>64,411.79</u>	<u>72,592.41</u>
<i>Travel and Subsistence Allowances</i>	28,479.25	77,765.53
<i>Special Account</i> (Cortina Conference)	90,583.75	0.00
<i>Contribution to Symposia</i> (covered by UNESCO Subvention in part)	8,200.00	20,300.00
<i>Publications</i>	13,577.05	10,409.09
	<u>205,251.84</u>	<u>181,067.03</u>
<i>Less:</i> Subvention collected from UNESCO/ICSU	<u>14,000.00</u>	<u>18,000.00</u>
	191,251.84	163,067.03
<i>Other Expenses</i>		
Frascati Conference, Meeting on Chemical Education ..	13,662.57	0.00
Contract Teaching of Chemistry	3,320.45	6,846.29
Payment for 14 annuities to Pension Fund of the Secretary General	15,200.00	0.00
Contribution (Bayer AG) to IUPAC Photosymposium	0.00	275.70
Bank Charges	710.33	1,511.19
Contribution to ICSU	2,199.22	1,777.60
Audit and Accounting Charges	2,741.85	2,506.98
	37,834.42	12,917.76
<i>Excess of Receipts over Expenses</i>	<u>0.00</u>	<u>36,257.87</u>
	<u>229,086.26</u>	<u>212,242.66</u>

UNESCO/ICSU GRANT ACCOUNT

Total of Expenditures	20,888.90	20,300.00
<i>Less:</i> to the debit of IUPAC Funds	<u>6,888.90</u>	<u>2,300.00</u>
US-\$	<u>243,086.26</u>	<u>US-\$ 230,242.66</u>

FINANCE COMMITTEE

Report to Council

Investments

Some adjustments in investments have been made to maintain and improve the income of the Union and to minimize the cost of servicing of the investments. The gold brick long held by the Union was sold and the money reinvested to give maximum income consistent with security.

Biennial Accounts for 1969/70 and Budgets

The Committee has noted the growth of revenue from the Company Associates Scheme and continues to press for more countries to participate.

The forward budgets have been reviewed and support given to the Treasurer. Because of inflationary forces, the Committee has emphasized the need for careful control and efficient purchasing of air travel which represents a very large portion of the expenditure of the Union.

New activities undertaken by the Union inevitably mean higher expenditure and the Committee has underlined the necessity of careful scrutiny of the financial aspects of each new activity in relationship to the total revenue/expenditure account.

Certain recommendations designed to reduce expenditures are being made to the Executive Committee.

Dues Structure

A close study was given to the development of a schedule to act as a guide for the National Adhering Organizations to use in determining their annual dues to the Union. A detailed scheme based upon the commercial turnover of the chemical industries in the member countries was finally recommended and is before Council for acceptance.

Terms of Reference of Committee

A restatement of the Terms of Reference of the Committee has been recommended to the Executive Committee together with statements on Composition of the Committee and Terms of Office of its Members. When approved these are to be issued as Standing Orders of the Executive Committee and will consolidate the experience gained in the first 8 years of the Committee.

The Terms of Reference emphasize the advisory nature of the Committee except in its responsibilities of handling the investments of the Union where it exercises executive authority in concurrence with the Treasurer and the Union banker.

Membership

Mr. P. M. ARNOLD, Chairman of the Committee from its inception, retired as of 12 March 1971. The Executive Committee appointed Dr. J. W. BARRETT as his successor. Dr. E. M. BEAVERS (USA) has been appointed a new Member of Committee.

J. W. BARRETT
Chairman, Finance Committee

I. PHYSICAL CHEMISTRY DIVISION

Report of President

I.1. Physicochemical Symbols, Terminology, and Units Commission

The definitive version of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* adopted by the IUPAC Council on 7 July 1969 was first published in *Pure and Applied Chemistry* **21**, 1-44 (1970) and later in the form of a hard-cover book.

A series of Appendices to the Manual, each dealing in detail with the symbols and terminology of a specialized field, has been started. The first such on *Definition of Activities and Related Quantities* has already been attached to the Manual. Others, with the cooperation of appropriate Commissions, are in various stages of preparation. Among these, the Electrochemical Appendix (tentative version) to the Manual (Commission I.3) and Colloid and Surface Chemistry Appendix (definitive version) to the Manual (Commission I.6) are in the final stages of preparation.

It is worth noting separately that cooperation on symbols matters continues to develop and improve with other bodies both within and without IUPAC. Commission I.1 is working closely with Commissions I.2, I.3, I.5, I.6, V.3, V.5 and the Commission on Quantities and Units of the Section on Clinical Chemistry. Outside of IUPAC close ties exist with Technical Committee 12 of the International Organization for Standardization, with the Commission on Symbols, Units, and Nomenclature of IUPAP, and with the Consultative Committee on Units of the International Committee on Weights and Measures.

For several years the Commission has been concerned that the physical quantity *amount of substance* should be recognized as being dimensionally independent, and that the mole (symbol mol), should be adopted by the General Conference on Weights and Measures (CGPM) as the base unit of this quantity in the International System of Units. The International Committee on Weights and Measures has now recommended that this be done at the CGPM in 1971.

I.2. Thermodynamics and Thermochemistry Commission

The IInd International Calorimetry Conference, jointly sponsored by the Commission and the US Calorimetry Conference, is taking place at Orono, Maine, on 12-14 July 1971. The 1st Conference in this series was held in Warsaw in September 1969. Plans have been initiated by the Commission for a Conference on Thermodynamics in Vienna in 1973.

Commission activities related to standardization matters include: (a) Revision of the *Resolution on the Publication of Calorimetric and Thermodynamic Data*. A draft version will be presented for approval at the Washington Conference; (b) Publication under the authorship of Prof. F. D. ROSSINI of *Report on the International Practical Temperature Scale of 1968* in *Pure and Applied Chemistry* **22**, 555 (1970); (c) Significant contributions through its Chairman and other Members to an important new ICSU-CODATA publication *Key Values for Thermodynamics*. The three foregoing activities will contribute to the rigour and clarity of publication of thermodynamic research results.

The Commission continues to supply advice and guidance to the project located at Imperial College (UK) for the publication of definitive Tables on

Thermodynamic Properties of Simple Fluids. The Director, Dr. S. ANGUS, has assembled a worldwide network of cooperating panels for various gases. Publication of data for argon as a supplement to *Pure and Applied Chemistry* is imminent. A related but nonoverlapping project on Critical Evaluation and Tabulation of Thermodynamic Data for Fluid Mixtures is under study by the Commission. The prime mover for this project is Dr. H. V. KEHIAIAN of the Polish Academy of Sciences.

Volume II of *Experimental Thermodynamics* is now under reexamination with a view to pushing this long planned work to completion as expeditiously as possible.

The Sub-Commission on Plasma Chemistry, Chaired by Dr. C. W. BECKETT, is sponsoring a small discussion conference of invited experts at Washington, DC, on 12-14 July 1971. From this meeting and subsequent discussion in the Commission a recommendation for the future role of plasma chemistry in IUPAC will be developed.

I.3. Electrochemistry Commission

An authoritative document, entitled *Electrochemical Kinetics: Guidelines for Design of Mechanistically Significant Experimentation* has been printed in *Information Bulletin* No. 39 (February 1971) and subsequently distributed for publication in 22 related journals in 11 countries. The Guidelines will facilitate enhanced coherence of published data from many sources.

A synopsis of the programme of the Commission has been published in several countries in about a dozen journals with combined readership of more than 100,000. Comments and cooperation were solicited from societies and individuals interested in pure and applied electrochemistry.

Preparation of the tentative version of the Electrochemical Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* has claimed the greater part of the efforts of Commission I.3. Formal and/or informal meetings, and correspondence, have taken place with Members of Commissions I.1, V.3, V.5, and I.6. Similar joint discussions will be held at the XXVIth IUPAC Conference in Washington after which publication as an Appendix to the *Information Bulletin* is anticipated. In 1972 a plenary meeting of the Commission will probably be necessary to prepare the definitive version of the Electrochemical Appendix for approval by Council at the 1973 Conference.

Tentative plans have been formulated to produce a Methods Manual for Electrochemical Kinetics. This is seen as a critical outline for experimental methodologies recommended for the elucidation of rates of electrode processes.

The Commission is becoming more active in data compilation work. Dr. R. TAMAMUSHI (Titular Member) represents the area of electrochemistry on the CODATA Task Group on Data for Chemical Kinetics and attended its meeting in May 1971 in Paris. The Commission has initiated a collation of Data on Electrochemical Kinetics and a longer range project has been started on the compilation of Electrochemical Thermodynamic Data.

A Symposium on Non-Aqueous Electrochemistry was held in Paris during 8-10 July 1970 under the joint sponsorship of Commissions I.3 and V.5. The meeting was attended by 200 electrochemists from some 20 countries.

I.4. Physicochemical Measurements and Standards Commission

A monograph *Characterization of Chemical Purity—Organic Compounds*, edited by Dr. L. A. K. STAVELEY, has been prepared under the auspices of

the Commission and recently published as a supplement to *Pure and Applied Chemistry*.

A *Catalog of Physicochemical Standard Substances* has been prepared and published in tentative form in December 1969 as an Appendix to the *Information Bulletin*. Corrections and improvements submitted by readers are incorporated in a definitive version that will be presented to the Division Committee at the Washington Conference in July 1971.

The Task Group on Standard Calibration Substances is proceeding vigorously under the Chairmanship of Prof. H. KIENITZ, with its programme to identify and seek ways to make available, reference substances for a large number of physicochemical measurements important in industry. At a meeting in Ludwigshaven in 1970, summarized in *Information Bulletin* No. 38 (November 1970), panels of experts were assigned the tasks of screening and proposing reference materials for 12 measurements or groups of related measurements (e.g., density, viscosity, distillation column performance, etc.). The Commission will seek a modest subvention for another meeting of the Task Group in 1972. Commission I.2 is cooperating with Commission I.4 in regard to thermodynamic reference materials.

The Commission is cooperating with and encouraging several national standardizing laboratories in meeting the need for (1) highly accurate data for the absolute density of water of definite isotopic composition; and (2) the vapour pressure of water. The Commission has also worked closely with the International Confederation for Thermal Analysis (ICTA) which is seeking a set of certified thermal analysis standards. Proposed ICTA temperature standards for DTA will be considered for approval by the Commission in July 1971.

I.5. Molecular Structure and Spectroscopy Commission

The Commission met with its Sub-Commission on Infrared and Raman Spectroscopy at Sydney in August 1969. The Sub-Commission (I.5.1) also met informally in August 1970 at Meriden, New Hampshire.

Infrared and Raman spectrometry remain areas of major involvement, but Commission I.5 is becoming increasingly active in other fields of molecular spectroscopy. These include nuclear magnetic resonance spectroscopy, photoelectron spectroscopy, microwave spectroscopy, and Mössbauer spectroscopy. This diversification of activity reflects current trends in the use of spectroscopic techniques by chemists.

At the request of the Executive Committee, the Chairman of Commission I.5 is serving as Chairman of an *ad hoc* Committee to report to the Bureau on the need to create a unit on mass spectrometry within IUPAC. Both the Analytical Chemistry Division and the Organic Chemistry Division are also represented on this *ad hoc* Committee on Mass Spectrometry which will submit its recommendations prior to the XXVth IUPAC Conference.

Commission I.5 has consulted spectroscopic organizations and individuals concerning Sections 2.8.09-2.8.15 of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* and will discuss possible improvements in symbols for absorption spectroscopy with Commission I.1 at the Conference in Washington.

Tables of Wavenumbers for the Calibration of Infrared Spectrometers for the range 4300-600 cm were completed in 1961. An extension of the range to 600-20 cm is ready for presentation by Sub-Commission I.5.1. at the XXVth IUPAC Conference.

There is great activity in various areas of spectroscopy concerning the

standardization of symbols and the publication of spectroscopic results in journals and data collections. The Commission is involved in such endeavours as follows:-

- (a) *Tentative Recommendations for the Presentation of Raman Spectra for Cataloging and Documentation in Permanent Data Collections* (Nomenclature Appendix No. 11 to *Information Bulletin*);
- (b) *Tentative Specifications for the Measurement and Evaluation of Infrared Spectra for Documentation Purposes* (see *Information Bulletin* No. 34: April 1969);
- (c) *Tentative Recommendations for the Presentation of NMR Data for Publication in Chemical Journals* (Nomenclature Appendix No. 4 to *Information Bulletin*);
- (d) Tentative recommendations for symbols and terminology in the field of Mössbauer spectroscopy have been prepared for discussion. This undertaking was requested by a group of active Mössbauer spectroscopists;
- (e) Initial steps are being taken regarding the formulation of internationally accepted symbols and nomenclature in the field of photoelectron spectroscopy.

Commission I.5 is collaborating closely with CODATA. The five projects mentioned in the preceding paragraph are all of great value to CODATA since they aim to increase clarity and exactness in the presentation, evaluation, tabulation, and storage of spectroscopic information. Regarding CODATA, the Chairman of Commission I.5 is also the Chairman of the CODATA Task Group on Computer Use and has recently become a Member of the CODATA Bureau.

I.6. Colloid and Surface Chemistry Commission

A definitive version of the *Manual on Definitions, Terminology, and Symbols in Colloid and Surface Chemistry* has been prepared and after consultation with Commissions I.1 and I.3 at Washington, will be submitted through the Division to Council for approval.

Also at the meeting in Washington the Commission plans to finalize a tentative version of Nomenclature for Heterogeneous Catalysis and to seek approval for its publication.

A tentative proposal for Nomenclature for Zeolites and Molecular Sieves will be discussed at Washington but will not be ready for Division and Council action.

In cooperation with a Working Party of the British Society of Chemical Industry, a modest programme for making available standard samples for surface area determination is being developed.

Invitations to prospective authors of contributions to a resource book for teachers, dealing with topics in colloid and surface chemistry for incorporation in standard courses of physical and analytical chemistry at the university level, have been sent to 35 persons. A provisional list of educational films covering topics of interest to colloid and surface chemists has been compiled.

At the Washington Conference the Commission will consider cosponsorship of an International Symposium on Colloid and Surface Chemistry in 1976 planned by the ACS Division of Colloid and Surface Chemistry to celebrate its 50th anniversary.

G. WADDINGTON
President, Physical Chemistry Division

II. INORGANIC CHEMISTRY DIVISION

Report of President

Meetings

A meeting of Officers of the Division was held in Göttingen on 19th June 1970, attended by Prof. O. GLEMSE (President), Prof. V. GUTMANN (Vice-President), and Prof. R. COLLONGUES (Secretary). The minutes are available: they contain (1) Discussions about Names of New Elements, (2) IUPAC Unit on Coordination Chemistry, (3) Review of Work of the Commissions, (4) Preparation for the XXVIth IUPAC Conference (1971, Washington), (5) Any Other Business.

A further meeting between the President and the Vice-President of the Division was held in Göttingen on 19th May 1971 to discuss Division Problems and to prepare for the meetings in Washington.

Commission II.1: Atomic Weights

With the publication of the 1969 *Table of Atomic Weights* [Pure and Applied Chemistry **21**, 95 (1970)] the Commission on Atomic Weights has instituted new procedures for evaluating reported data for the relative atomic masses (atomic weights) of the elements. The aim is to promulgate the values judged to be best with the largest amount of significant information yet no more precise than can be relied upon for use in science and technology.

Reevaluation, especially of new data, with a view to possible refinements of atomic weight values will continue to be the prime aim of the Commission. Small adjustments, e.g., in the atomic weight values for hydrogen and potassium, will be proposed at the Washington meetings of the Commission.

In the 1971 Report of the Commission reference should be made to the new *Manual of Symbols and Terminology for Physicochemical Quantities and Units* [Pure and Applied Chemistry **21**, 1 (1970)]. The usefulness of the Tables of Selected Radioactive Isotopes and of Atomic Masses of Selected Isotopes will be discussed. The products of nuclear technology will introduce progressively greater problems to be faced by the Commission. Finally, the Commission will discuss proposals for Membership.

Commission II.2: Nomenclature of Inorganic Chemistry

At its meeting in Cortina d'Ampezzo (1969) the Commission dealt mainly with two items:

1. Revision of the 1957 Rules ('Red Book').
2. Rules for organometallic compounds and organic compounds of boron, silicon, phosphorus, and arsenic. These rules are being prepared in collaboration with the Commission on Nomenclature of Organic Chemistry and will eventually be published as Section D of *Nomenclature of Organic Chemistry* ('Blue Book').

In Cortina d'Ampezzo a Drafting Committee was appointed to finalize the manuscript for the new edition of the Red Book. This Committee completed its work at a meeting in Columbus, Ohio, at the end of January 1970 and the manuscript is now in press.

Commission II.3: High Temperature and Refractories

Since the meeting in Cortina d'Ampezzo (1969) the Commission has been officially brought to a strength of 6 Titular Members, 6 Associate Members, and 8 National Representatives.

At the University of Karlsruhe a meeting of the Commission was held on 24th April 1970, attended by 11 people: Prof. GLEMSER, President of the Division, 5 Titular Members, 2 Associate Members, and 3 National Representatives. Minutes are available.

Vapour pressure work on gold, silver, and cadmium has been completed and standard materials are available. Technical reports have been prepared and are being considered for publication in *Pure and Applied Chemistry*. Data are still being awaited for platinum and tungsten. These should be available before 31st December 1971. At the meeting in July 1971, the Commission intends to consider the need for work beyond these 5 metals. The melting point work on aluminium oxide has been reported in *Pure and Applied Chemistry* [21, 115 (1970)]. The President of IUPAC, Dr. REES, in October 1969, transmitted the Commission's recommendation of this material as a secondary reference point to the International Bureau of Weights and Measures. A list of potential Members is available for a new Task Force to consider work on another high melting reference material. So far 8 scientists have offered assistance. The *High Temperature Bibliography* has undergone change of editorship, method of financing, and centre of distribution. Dr. M. G. HOCKING (Imperial College, UK) is the new editor and distributor, taking over from Mr. J. J. DIAMOND, who has been reassigned at the National Bureau of Standards to new duties. This current awareness quarterly is now being sold at an annual subscription of \$3.60, including surface mail from London. With a grant of \$360 from the 1970 Inorganic Division Contingency Fund and a special order of 40 subscriptions from USA, the publication continues without an insurmountable loss of time. It is very close to self-support; there are about 400 subscribers. Prof. F. E. STAFFORD (Northwestern University) has written the first draft of a report on the current status of ionization cross sections and the effects of molecular fragmentation. The Commission is concerned about the effect on the data being produced using mass spectrometry for high temperature chemical equilibria. Also, Prof. E. FITZER is considering the need for a definitive monograph on the varieties of carbon. The readership aimed at consists of those for whom carbon is not a speciality. Dr. D. D. CUBICCIOTTI produced a newsletter for high temperature chemists around the world. Versions were published as a news item in chemical bulletins of 3 countries.

A joint symposium on High Temperature Techniques is being arranged for inclusion in the XXIVth IUPAC Congress at Hamburg in 1973. Prof. C. B. ALCOCK is working out details with the Congress Organizing Committee.

O. GLEMSER
President, Inorganic Chemistry Division

III. ORGANIC CHEMISTRY DIVISION

Report of President

The Organic Chemistry Division has maintained, with one exception, a vigorous programme of activity both in the organization of symposia and in the activity of its Commissions. The number of symposia with IUPAC sponsorship has greatly increased and a number of new biennial symposia are planned.

It had originally been intended that the Division Committee would meet in Munich in September 1970. However, since no major problems had arisen, and in an effort to save money, it was decided, after consultation with all Members, not to hold this meeting.

It is appropriate in this introduction to make reference to the VIIth International Symposium on the Chemistry of Natural Products held in Riga. The exemplary success of the meeting was marred by the sudden and untimely death of the Honorary Chairman, Prof. M. M. SHERYAKIN, on the penultimate day. It is not necessary to make reference here to the great contributions that Prof. SHERYAKIN had made to organic chemistry, but it is desirable to state how hard he had worked to ensure that the VIIth Symposium was organized according to the ideals of IUPAC. Prof. SHERYAKIN intervened actively and successfully to ensure that all scientists who wished to attend the Riga meeting were able to obtain visas no matter what their country of origin. The Plenary Speakers at the VIIth Symposium have requested that the volume of Symposium lectures shall be dedicated to Prof. SHERYAKIN with an appropriate photograph and biographical memoir, which has been approved. It will constitute an appropriate memoir for a man of great distinction in all aspects of scientific activity.

Nominations

The Division Committee has approved the following nominations since the XXVth IUPAC Conference in Cortina d'Ampezzo:-

- Commission III.2: Dr. S. NATORI (Japan)—Titular Member
Commission III.3: Prof. G. J. HOYTINK (UK)—Titular Member
Section III.4: Dr. A. I. RACHLIN (USA)—Titular Member [instead of
Dr. L. STERNBACH (USA)]
Prof. J. A. GAUTIER (France)—Associate Member
Dr. M. PROTIVA (Czechoslovakia)—Associate Member
Dr. L. STERNBACH (USA)—Associate Member
Prof. T. URBANSKI (Poland)—Associate Member

The untimely death of Prof. M. M. SHERYAKIN (USSR) has created a vacancy for 1 Member in the Division Committee.

Dr. K. TAKEDA (Japan), nominated at Cortina d'Ampezzo as a Titular Member of Section III.4, declined the nomination due to ill health.

Commissions

III.1: *Nomenclature of Organic Chemistry*. This important Commission has continued its work during the period 1969-1971. The tentative views of the Organic Chemistry Division as to the future composition of the Commission have been communicated to Prof. P. E. VERKADE, Chairman of the Commission, who will be retiring after the XXVIth IUPAC Conference in 1971. The Commission will meet during this Conference at which time its new composition must be finally determined.

The work on the *tentative* version of *Section D of Nomenclature of Organic Chemistry* has been continued and is now completed as far as the Commission as a whole is concerned. This Section contains the following Subsections:

- A. Coordination compounds
- B. Organometallic compounds
- C. Chains and rings containing heteroatoms
- D. Organic compounds containing P, As, Sb, Bi
- E. Organosilicon compounds
- F. Organoboron compounds

This work has been done jointly with Commission II.2.

The manuscript for a new and combined edition of *Sections A, B, and C of Nomenclature of Organic Chemistry* has been prepared. Publication of this book can be expected within a few weeks. Its content will not differ fundamentally from that of the previous editions.

The *tentative* version of Part I of *Carbohydrate Nomenclature*, prepared jointly with the IUPAC-IUB Commission on Biochemical Nomenclature, has been published.

A joint *tentative* version of a document containing rules for *Nomenclature of Carotenoids* has just become available for publication.

A start has been made with the preparation of a document on *General Organic Chemical Nomenclature for Groups of Natural Products*.

The study of the *Dyson-Taylor-Patterson system* (DTP system), a very simple method for the nomenclature of polycyclic systems, has been taken up again. This is part of the work of the Commission on new methods for nomenclature.

Associated with Commission III.1 and with the Organic Chemistry and Macromolecular Divisions is the IUPAC-IUB Commission on Biochemical Nomenclature. This Commission, under the Chairmanship of Prof. O. HOFFMANN-OSTENHOFF, met in Helsinki on 1-4 July 1970. It faces important and difficult problems of nomenclature. The following sets of *tentative* rules were submitted (1 April 1970) to the Organic Chemistry Division:

- (i) Abbreviations and Symbols for Nucleic Acids, Polynucleotides and their Constituents
- (ii) Nomenclature for Vitamins B₆ and Related Compounds
- (iii) Abbreviations and Symbols for Description of the Conformation of Polypeptide Chains

Publication of these tentative rules was approved by the Organic Chemistry Division and has taken place as Appendices to the *Information Bulletin*.

The Organic Chemistry Division has requested the IUPAC-IUB Commission to produce an *IUPAC-definitive* version of the following tentative rules of nomenclature (*Information Bulletin* No. 32, August 1968):

- (i) Nomenclature of Steroids
- (ii) Nomenclature of Cyclitols
- (iii) One-letter Notations for Amino-acid Sequences

III.2: *Chemical Plant Taxonomy*. This Commission has continued to pursue vigorously its two main aims of furthering international collaboration and exchange of ideas relating to the application of chemical and biochemical data to taxonomic and other systematic problems in biology, and of encouraging the storage and retrieval of all information pertinent to such problems.

These concerns were clearly reflected in the two-day meeting of the Commission held on 11-12 June 1970 in Hornbaek, Denmark. That meeting was attended by all Members of the Commission, including the new Member Dr. S. NATORI, except Prof. G. OURISSON. In addition, Prof. T. BOCHER (Denmark) and Prof. B. L. TURNER (USA) were invited to attend the discussion on the relationship of the Commission to other bodies. During discussion of this item, the Chairman (Prof. A. KJAER) pointed out that the expected collaboration between the Commission and an equivalent Committee established by the International Association of Plant Taxonomy (IAPT) had come to nothing. In early 1970, the Chairman of the IAPT Committee (Prof. A. LOVE, USA) proposed to his parent organization, the establishment of an International Organization of Chemosystematics (IOC) to parallel the International Organization of Plant Biosystematists (IOPB) under the auspices of IAPT. It was suggested that 5 Members of Commission III.2 should act as Members of the proposed IOC. The proposed establishment of IOC appeared to be the next logical step in the future of chemical taxonomy and the Commission was anxious to help actively in its formation. The Members felt, however, that no firm decisions should be taken without the widest possible consultation.

The Chairman suggested at Hornbaek that the whole matter of IOC might best be examined by a joint *ad hoc* Committee of his Commission and IAPT. The Commission as a whole approved of this suggestion and proposed that the joint Committee examine ways and means for ensuring the widest collaboration of all those engaged in chemotaxonomy and cognate areas of study.

Since the Hornbaek meeting, steps have been taken in all these directions. The joint *ad hoc* Committee of the Commission with IAPT has been established with the following membership: Prof. W. F. GRANT, Chairman (IAPT), Dr. T. SWAIN, Secretary (IUPAC), Dr. J. H. HARBORNE (IUPAC), Prof. A. LOVE (IAPT), Prof. T. J. MABRY (IUPAC), and Prof. B. L. TURNER (IAPT). The Committee was charged with examining all aspects of establishing an International Organization for Chemosystematics and reporting back to the parent organizations within a year. In addition, further steps had been taken to inform the relevant bodies in the Division of Botany of the International Union of Biological Sciences and the International Union of Biochemistry.

The second theme taken up at the Hornbaek meeting in relation to international collaboration was the need to organize an international symposium on chemotaxonomy under the auspices of the Commission. The latter decided that the symposium should be on the theme *Chemistry in Evolution and Systematics*, including sections on Insect-plant Coevolution, Chemistry of Geographical Races, Comparative Biosynthetic Pathways, Molecular Evolution, and Fossil Chemistry. It was planned to hold the meeting at University of Reading (UK) in September 1971. In the event, however, it proved impossible to organize the meeting in 1971, and the Commission is now planning it for the summer of 1972 in Strasbourg (France).

A further main theme which occupied the Hornbaek meeting was that of publication of and retrieval of information in the field of chemotaxonomy. It was heartening to note that the situation with regard to publication was now in a better state than was reported in 1969. Further issues of the *Annual Index on the Reports on Plant Chemistry* (for 1963 and 1965) were in the press and that for 1964 was issued late in 1969. A new editorial board had been established for the *Index* and Dr. NATORI was an active member. It was

proposed to prepare future issues directly from the abstract journals which should increase the speed of publication.

Much information on chemotaxonomy was now being abstracted in *Excerpta Botanica* (Section A: Taxonomy) and *Berichte Biochemie und Biologie*. In addition, publication of the *Lynn Index*, a comprehensive bibliography of phytochemistry from 1560 to 1954 collected by the late Prof. E. V. LYNN (Massachusetts College of Pharmacy) had been resumed under the direction of Prof. N. FARNSWORTH (University of Illinois). Prof. FARNSWORTH was also responsible for the organization and publication of *Pharmacognosy Titles*, which abstracted the literature on natural products from the point of view of chemotaxonomy, phytochemistry, biosynthesis, biological activity and methodology. The Commission has commended Prof. FARNSWORTH for his valuable efforts, and hoped that funds would continue to be made available for him to carry on both these publications. The Commission also took note of the continued successful publication of *Chemical Plant Taxonomy Newsletter* which was produced jointly by Dr. HARBORNE and Prof. MABRY. At the Hornbaek meeting, the Commission agreed that it might be ideal if the *Newsletter* could be officially sponsored by the Commission, and this question had been taken up with the Division Committee.

The final major topic dealt with at the Hornbaek meeting was that of information retrieval. The pilot-scale project carried out by the Kline Science Library, Yale University, had shown that there was no easy way to obtain chemosystematic information using existing electronic data systems. Chemists often did not give the exact specific name of the plants which were examined, and *vice versa* biologists often only referred to some broad class of substances isolated: these defects were naturally reflected in the abstracts. The Commission had noted, however, that there were now some more broadly based abstracting services being established and further information about these services was being sought.

The recommendations on the identification and handling of plants used in phytochemical research were also reviewed at Hornbaek, and note was taken of the need to extend the rules to include crude drugs or other materials of plant origin. Prof. TURNER and Dr. SWAIN had accordingly revised these rules and they would be sent to the editors of appropriate journals in the near future.

III.3: *Organic Photochemistry*. This Commission was established for good reasons at the meeting in Cortina d'Ampezzo in 1969. Until the meeting in St. Moritz in July 1970 only 1 further Titular Member had been appointed (Prof. G. J. HOYTINK). At St. Moritz it was proposed to change fundamentally the nature of the Commission and to establish it as a Commission on Electronically Excited States in Chemistry, Physics, and Biology. It was suggested that none of the additional Titular Members should be organic chemists. At this point the President of the Organic Chemistry Division decided that, whilst such a broadly based interdisciplinary Commission would have much to contribute to science, it could not come under the aegis of the Organic Chemistry Division. The President, therefore, proposed that the 3 Titular Members of the existing Commission should resign and submit to the Bureau of IUPAC new proposals along the broad lines indicated above. The Chairman of Commission III.3 agreed with this suggestion and resigned. The whole question will be discussed at length by the Organic Chemistry Division in Washington and any necessary recommendations made to the Bureau. The original reasons for setting up Commission III.3 still remain perfectly valid.

III.4: Medicinal Chemistry. This new Section was initiated at the Conference in Cortina d'Ampezzo in 1969. It had proved to be an exemplary organization. The Chairman (Prof. E. CAMPAIGNE) and the Secretary (Dr. A. I. RACHLIN) had shown exceptional energy, initiative, and business efficiency in quickly setting up a Section which was already playing an important role in IUPAC. The Section held a first meeting (13-15 February 1970) in Zürich and issued a concise report on its activities as well as a proposed 'constitution'. A standing Committee on meetings had been organized under the Chairmanship of Dr. E. J. ARIENS. An *ad hoc* Committee on education in medicinal chemistry had been formed and a further small *ad hoc* Committee had begun to look into 'bad' patent practices. The Secretary had issued 3 Section Newsletters. It was also intended to establish a system of 'Correspondents' or 'Representatives' who would exchange information of interest to medicinal chemists.

One of the problems that faced the Medicinal Chemistry Section was the existence of the so-called International Society of Heterocyclic Chemistry for which Prof. R. N. CASTLE (USA) held responsibility. This organization was seeking to perform a function, the regular organization of international meetings, that properly belonged to IUPAC. Correspondence between the Organic Chemistry Division and Prof. CASTLE had continued with a view to the International Society of Heterocyclic Chemistry being associated with IUPAC.

Sponsorship

Symposia already completed:

Conformational Analysis, Brussels, Belgium, 9-12 September 1969. A successful well-organized meeting.

VIIth International Symposium on Chemistry of Natural Products, Riga, USSR, 21-27 June 1970. This meeting was very efficiently organized and there was a large (1500) attendance.

IIIrd International Symposium on Photochemistry, St. Moritz, Switzerland, 12-18 July 1970

Vth International Symposium on Carbohydrate Chemistry, Paris, France, 17-22 August 1970

International Symposium on Chemistry of Nonbenzenoid Aromatic Compounds, Sendai, Japan, 24-28 August 1970

Symposium on Cycloaddition Reactions, Munich, Germany, 7-10 September 1970

IInd International Symposium on Organic Solid-state Chemistry, Rehovot, Israel, 14-18 September 1970

International Symposium on Antibiotics, St. Marguerite, Quebec, Canada, 1-3 March 1971

International Meeting on Boron Compounds, Liblice, Czechoslovakia, 21-25 June 1971

Forthcoming Symposia:

Vth International Conference on Organometallic Chemistry, Moscow, USSR, 16-22 August 1971

VIIIth International Symposium on Chemistry of Natural Products, New Delhi, India, 6-12 February 1972

Symposium on Chemistry in Evolution and Systematics, Strasbourg, France, 3-8 July 1972

IVth IUPAC International Photochemistry Symposium, Karlsruhe, Germany, 16-22 July 1972

IIIrd International Symposium on Carotenoids other than Vitamin A,
Cluj, Romania, 4-7 September 1972

Ist International Conference on Physical Organic Chemistry, Crans-sur-
Sierre, Switzerland, 4-8 September 1972

Projected symposium:

Ist International Symposium on Organic Synthesis, Zürich, Switzerland,
1974—to be organized by Prof. C. H. EUGSTER

Other Activities

As a result of the Division Committee meeting in Cortina d'Ampezzo the Secretary of the Division had undertaken to consult with the Editors of the leading journals in the field of organic chemistry regarding their attitude towards problems of future publication practise. It was important to establish if in future all papers of adequate standard should continue to be published in full or if some abbreviated form of publication was acceptable with a deposition of the complete manuscript in central archives from whence a photocopy would be available at a small charge. The relationship between the publication of preliminary communications and the full publication of the experimental evidence also needed to be examined. At present there was a tendency to publish a preliminary communication and to forget the obligation thereby incurred to publish the full justification for the conclusions reached within a reasonable time.

The proposal had also been made that the Organic Chemistry Division should publish for general circulation a report on its scientific activities and objectives. The objective of this report would be to make the contributions of IUPAC to the present and future progress of organic chemistry more widely known.

D. H. R. BARTON
President, Organic Chemistry Division

IV. MACROMOLECULAR DIVISION

Report of President

Since the Cortina Conference in 1969 one formal meeting of the Division Committee was held in Prague on 12 and 13 June 1970. In addition an informal meeting took place after the International Symposium on Macromolecular Chemistry in Budapest on 3 September 1970. The Executive Committee of the Division met on 27 April 1970 in Louvain and on 24 June 1971 in Prague. The Division was represented in the Bureau meeting in Vienna in October 1970 by its Secretary, Prof. G. SMETS, replacing the President of the Division who was not allowed to travel abroad for political reasons.

Nomenclature

Dr. C. SUHR (Germany) resigned as a Titular Member of the Commission on Macromolecular Nomenclature (IV.1) in 1971. Dr. W. RING (Germany) has been appointed in his place. At a meeting in Ravello, July 1970, the Commission continued its discussions on stereochemical nomenclature of polymers, on nomenclature of linear polymers, and considered a number of recommendations on definitions, abbreviations, *etc.*, coming from ISO and from Chemical Abstracts. The Commission has finished the work on two tentative nomenclature documents which have since been published (*List of Abbreviations for Synthetic Polymers and Polymer Materials*: Appendix No. 12 to *Information Bulletin*, February 1971; *Basic Definitions of Terms Relating to Polymers*: Appendix No. 13 to *Information Bulletin*, February 1971). Other projects of the Commission at this time concern the development of a systematic nomenclature for polymers based on the structural repeating unit and stereochemical problems in the macromolecular field.

Molecular Characterization of Commercial Polymers

In 1969 it was decided to study commercial standard samples of polymers in order to see if the same technique used in different laboratories led to the same results and to find precise methods for characterization of molecular parameters, such as degree of branching, degree of stereoregularity, *etc.*

Eighty-five laboratories took part in this action organized by Dr. H. BENOIT. As a result, a summarizing report was prepared showing the great discrepancies in determinations of molecular weight of some polymers. Since the disagreement in results was especially pronounced for low and high pressure polyethylene, all laboratories involved sent their representatives in March 1971 to Strasbourg where a research programme was established to elucidate and solve these difficulties. The probabilities of errors were established and it is expected that relatively few supplementary measurements will distinctly improve the situation.

This action will continue and since there are many other problems of the same importance which can be solved only by international cooperation, it will be proposed to establish a Commission for Molecular Characterization of Polymers.

Relationship of Performance Characteristics to Basic Parameters of Polymers

A Sub-Committee headed by Dr. J. W. BARRETT, Dr. A. J. DE VRIES, and Dr. H. BENOIT, organized a working meeting on Relaxation Phenomena and Mechanical Properties of PVC in Strasbourg on 5 and 6 March 1970. There were about 50 attendants. Two of the papers which were presented will be

published in the near future. The great importance of such small meetings in which industrial and academic scientists can freely exchange their experimental findings was appreciated by all the attendants.

Up to the summer of 1971, 19 meetings of this Working Group have been held, dealing with the structural parameters of polymers which were examined in parallel by the group headed by Dr. BENOIT.

The various collaborative studies have already proved their usefulness and can be expected to yield even more interesting results in the future following the working scheme developed according to the principles defined by the original founders of this group.

Dr. BARRETT who led this Group from its very beginning, resigned from this position at the end of 1970. Following his recommendation, he was replaced by Dr. DE VRIES. The Division Committee which acknowledges the importance and successful results of this Group will carefully consider whether the status of a regular IUPAC Commission would be more appropriate for its work.

Teaching and Research in Macromolecular Science

Further information has been collected about education at the postgraduate level in the polymer field in relation to education in other branches of chemistry. A striking disproportion was found between the representation of macromolecular science in teaching and research activities in academic and national research centres (only 5-7% of all Ph.D.'s are devoted to polymer science) on the one hand, and the enormous expansion of polymer chemistry and technology (40-50% of scientists educated in these centres are working in the polymer field) on the other.

Symposia

Regular International Symposia on Macromolecules sponsored by IUPAC were organized in September 1969 in Budapest (over 1,000 active attendants) and in August 1970 in Leiden (over 700 active participants). In agreement with the general policy of the Division, the topics were restricted even in these general meetings: the Budapest Symposium was rather concentrated on chemistry and the Leiden Symposium on physics. The next symposia in this series will be organized under IUPAC sponsorship in Boston (July 1971), in Helsinki (July 1972), and in Aberdeen (September 1973).

Besides the traditional general meetings stimulated and sponsored by IUPAC through the Division, there were organized in Prague some smaller meetings, strictly limited in their scope, the so-called Microsymposia on Macromolecules. The topics of these smaller meetings were as follows: Rheology of Polymer Solids (September 1969), Cyclopolymers and Cyclopolymerization (September 1969), Light Scattering in Polymer Science (September 1969), Polyvinylchloride—Its Formation and Properties (September 1970). A Conference on Chemical Transformation of Polymers was held in Bratislava in June 1971.

A Gordon-type discussion meeting on Models of Biopolymer Structure and Functions was held in September 1970 in Marienbad under the joint sponsorship of IUPAC and IUPAB.

Further Microsymposia are scheduled on Morphology of Polymers (August 1971, Prague), Thermodynamics of Interactions in Polymer Solutions (September 1971, Prague), and Photochemical Processes in Polymer Solutions (June 1972, Louvain).

O. WICHTERLE
President, Macromolecular Division

V. ANALYTICAL CHEMISTRY DIVISION

Report of President

Since the XXVth Conference of IUPAC, held in Cortina d'Ampezzo in 1969, 10 reports have been published in *Pure and Applied Chemistry* and 8 more are in press: these are listed under the headings of the relevant Commissions. Two tentative reports have been published as Appendices to the *Information Bulletin*; 6 further reports are under consideration by the Division Committee. These statistics reflect the effective activity of the Commissions within the Division whose work has been considerably facilitated by the availability of funds for Commission meetings and from the Division Contingency Fund.

The Division provided the Chairman and 7 Members of an *ad hoc* Committee set up by the Bureau to examine the necessity for, and the problems associated with, the establishment of an International Centre for Analytical Chemistry. This Committee reported to the Bureau in October 1970.

The Division records with regret the death of 3 serving Members—Prof. L. ERDEY (Division Committee), Dr. W. SCHÖNIGER (Commission V.2), Prof. L. G. SILLÉN (Commission V.6)—and a former Member, Prof. F. FEIGL.

Commission V.1 (Analytical Reactions and Reagents) has continued its work, in cooperation with Section VI.1, on the production of standard methods of analysis for the control of food additives in fulfillment of the contract with CEE. Seventeen methods were submitted in 1969; in 1970, 10 methods were submitted for the 1970 contract and another 17 in partial fulfillment of the 1971 contract. For 1971, 3 new methods are to be considered and all methods submitted since 1967 are being reviewed. Meetings of the Coordinating Committee were held in 1970 and 1971.

Commission V.2 (Microchemical Techniques and Trace Analysis) met in Graz in September 1970. Work is progressing on 5 projects concerned with aspects of organic microanalysis. It is hoped that 3, dealing with the determination of nitrogen and of fluorine and with the expression of errors, will have been completed by the time of the XXVIth IUPAC Conference; the other 2, on determination of carbon and hydrogen in compounds containing heteroelements and of metals in organometallic compounds, have been held up by difficulties in the distribution of samples. Considerable delay has occurred in the publication of a report on errors in microanalysis completed in 1969.

A study on the purification of chemicals has been completed and the report has been passed to the Division Committee. Two other projects dealing with impurities in chemicals and in oxygen and helium are in progress; the fate of a study on mass absorption coefficients used in electron-beam microanalysis is under consideration.

Reports: Study on the Accuracy and Precision of Methods for the Determination of Carbon and Hydrogen in Organic Compounds: **21**, 47 (1970).

Erreurs en Microanalyse organique elementaire: in press.

Commission V.3 (Analytical Nomenclature) met in London in November 1970. Two projects, on terminology of liquid-liquid distribution and nomenclature of automatic analysis, have been completed and it is hoped that a third, on ion-exchange nomenclature, will be completed at Washington. Tentative reports on nomenclature of chromatography, of thermal analysis, and of mass spectrometry, and on trival names and synonyms, and on retention of

the concept of normality have been passed to the Division Committee. Projects under active consideration include scales of working, contamination phenomena, publication of analytical methods, and kinetic methods of analysis. It is hoped to arrange the transfer of the project on standard substances to Commission V.1 and to work jointly with Commission V.1 on selectivity index.

Reports: Recommended Nomenclature for Titrimetric Analysis: **18**, 429 (1969).

Recommendations for the Presentation of the Results of Chemical Analysis: **18**, 439 (1969).

Sodium Carbonate and Sulphamic Acid as Acid-base Primary Standards: **18**, 445 (1969).

Recommended Terminology of Liquid-liquid Distribution and Extraction: **21**, 111 (1970).

Recommended Nomenclature for Automatic Analysis: **21**, 529 (1970).

Commission V.4 (Spectrochemical and Other Optical Procedures for Analysis) met in Dortmund in August 1970, when comments on the tentative report on nomenclature, symbols, units and their usage in spectrochemical analysis—I were considered; a finalized version has now been passed to the Division Committee. A second report dealing with flame atomic absorption, emission, and fluorescence spectroscopy is nearly ready for submission as a tentative report.

Commission V.5 (Electroanalytical Chemistry) is continuing its work on the purification of solvents, the subject of several recent reports, and a report on the purification and purity of reagents should soon be ready. Three projects on data compilation are making good progress; polarographic information is being collected and presented in a data card format; reports are nearing completion on half-wave potentials in non-aqueous media, especially dimethylsulphoxide and tetramethylenesulphone (sulpholane) and on dissociation constants of uncharged and cationic acids in dimethylformamide; an updated compilation of pK values of organic bases is also nearly complete. Work continues on a study of the pretreatment of solid electrodes and on a reevaluation of the validity and usefulness of the coulomb as a secondary standard and of the coulometric method as a highly precise procedure for analytical titrimetry. A report on the status of electroanalytical chemistry in India is being reviewed by the Commission. An earlier report on classification and nomenclature of electroanalytical methods is being revised and updated; the Commission is cooperating with Commissions I.1 and I.3 in the preparation of a list of symbols and terminology to be incorporated as an electrochemical appendix to the IUPAC *Manual of Symbols and Terminology for Physicochemical Quantities and Units*. This project was the subject of two meetings, in March and July 1970, of representatives of the Commissions.

Reports: A Proposal for the Practical Measurement of pH in Amphiprotic and Mixed Solvents: **18**, 421 (1969).

Dissociation Constants of Inorganic Acids and Bases in Aqueous Solution: **20**, 133 (1969).

Potentiels d'Oxydo-reduction des Corps minéraux en Solution aqueuse: in press.

Purification of Dimethylsulfoxide for Electrochemical Experimentation: in press.

Purification of Pyridine and Tests for Purity: in press.
Purification of *N*-Methylacetamide and Tests for Purity: in press.
Purification of Propylene Carbonate and Tests for Purity: in press.

Commission V.6 (Equilibrium Data) is continuing to revise and update the tables of stability constants of inorganic and organic substances after some reallocation of personnel necessitated by the death of Prof. SILLÉN. A project on selected stability constants has, however, had to be abandoned. Two groups are working on the project on distribution equilibria: a report on phosphorus-containing extractants is being considered by the Commission and considerable progress has been made on chelating extractants other than phosphorus-containing compounds. It is hoped that the first part of a report on critical surveys of stability constants, including chapters on cyanide and EDTA complexes, will be completed during 1971. Also due for completion in 1971 is a project on the use of standard ionic media in measuring stability constants. The Commission has been examining the possibility of introducing into abstracts a means of indicating the presence of equilibrium constants or other data in papers published in journals. A proposal is being prepared for consideration by the Division at the XXVIth IUPAC Conference.

Report: Recommended Symbols for Solution Equilibria: **18**, 459 (1969).

Commission V.7 (Analytical Radiochemistry and Nuclear Materials) is continuing the preparation of reports publicizing the utility of radioactive methods; light element analysis and high energy photon activation are currently being considered. Several members of the Commission are intimately involved in the OECD Characterization Exchange and their experiences will form the basis of discussion of any future trace characterization exchanges which might be sponsored by the Commission now that the intercomparison of methods for the determination of uranium in low grade ores has been completed. During the work on reference materials for activation analysis it has become apparent that there is a need for standard reference materials, with certified trace analyses, for all types of trace analytical method, not only activation analysis; the Commission considers that the scope of the project should be widened to include trace methods other than radiochemical. 'State of the art' reports on the analysis of uranium oxides and of graphite are being prepared. Difficulties have arisen in the compilation of authoritative references in radiochemistry in languages other than English but the collection of material for a compilation of reviews on radiochemical subjects continues. The first part of a glossary of terms is in its final stages within the Commission; a second part is in preparation. The project on purity of reagents has been concluded with the circulation of a letter on isotopically disturbed reagents to reagent manufacturers and with the publication of a report on commercial radiochemicals. A project on conventions for flux monitoring and definition of sensitivity is continuing.

Reports: An Enquiry into the Purity of Commercial Radiochemicals: **21**, 87 (1970).
Radioactive Tracers in Inorganic Chemical Analysis: in press.
Preparation of Reference Samples for Uranium in Low Grade Ores: in press.

W. KEMULA
President, Analytical Chemistry Division

VI. APPLIED CHEMISTRY DIVISION

Report of President

This report summarizes the activities of this Division during the period between the XXVth IUPAC Conference (Cortina d'Ampezzo, July 1969) and May 1971.

A great deal of attention has been devoted during this period to an examination of the structure and scope of activities of the Applied Chemistry Division with a view to attaining a closer relationship between IUPAC and industry. Early in 1970, the Executive Committee set up an *ad hoc* Committee of 5 persons 'to consider how the structure and working of IUPAC might be modified to cater for the needs of applied chemistry'. This *ad hoc* Committee met in Frankfurt on 14-15 June 1970 and later reported to the Bureau. It was urged that the other Divisions should have additional representation from industry. Since it is manifestly impossible to cover within the Applied Chemistry Division even a proportion of the important chemical technologies, it was considered advisable to concentrate in certain well-defined areas. The Committee recommended that problems relating directly to human welfare should be chosen as a logical direction in which to concentrate. Definite recommendations were drawn up and received the unanimous approval of those elected Members of the Division Committee who replied to the recommendations. These recommendations have been sent to the Bureau for consideration. If the recommendations are accepted, 2 Sections will be dissolved and 1 will be appointed, giving a net decrease from 8 to 7 Sections. In addition, changes in structure and scope of activities of several individual Sections have been advocated.

The following is a summary of activities of each of the Sections of the Applied Chemistry Division.

VI.1. Food Section

This Section, under the Chairmanship of Dr. H. EGAN, has operated mainly through its 2 Commissions. A broadened scope of activities will be considered at the Washington Conference (1971), together with accompanying desirable changes in structure of the Section. The Section met in September 1970 and reviewed its activities.

The Section has been concerned with the execution of the 1970 IUPAC-CEE Contract and in updating some of the methods from previous contracts. Draft methods were selected from submissions by Members of the Section and submitted for comment to the Members of the Commission on Analytical Reactions and Reagents (V.1). After collation of these comments, they were incorporated into draft methods which were then considered by the Section at its 1970 meeting. The Section has also reviewed all previous methods submitted by IUPAC to the CEE and the 1971 contract involves updating these methods. In addition, the Section has completed the survey of analytical methods available for the estimation of some food additives in food. This work was begun in 1965 and has now been updated, completed, and is in course of publication.

VI.1.1. Trace Substances Commission

This Commission, under the Chairmanship of Dr. H. FISCHBACH, has operated through 2 Sub-Commissions.

VI.1.1.1. Mycotoxins Sub-Commission

This Sub-Commission, under the Chairmanship of Dr. N. R. JONES, has undertaken a collaborative study on aflatoxins and an evaluation of the Best Foods method for aflatoxin analysis. In addition, a draft report on cleanup procedures in aflatoxin analysis has been prepared. Collaborative work on materials other than groundnuts presenting possible problems in the international trade has been deferred in view of current work in North America, the results of which will be made available to the Commission.

VI.1.1.2. Smoke Constituents Sub-Commission

The programme of this Sub-Commission, under the Chairmanship of Dr. H. FISCHBACH, was reviewed at the September 1970 meeting in the light of the progress made to date in collaborative trace analysis studies and the priorities now appropriate to other potential carcinogenic environmental contaminants. In this review, the problems of nitrosamine contamination were clearly identified and the Sub-Commission is now collating the information on nitrosamine determination in food and expects to expand the work in the coming year. The assay procedure for benzo(a)pyrene will be published as a recommended technique. Preliminary consideration has been given to a collaborative assay of multicomponent polynuclear aromatic hydrocarbon preparations.

VI.1.2. Food Additives and Contaminants Commission

Following the resignation in July 1970 of Dr. J. H. BUSHILL, previous Chairman, this Commission has been led by Dr. R. MARCUSE. Tentative minimum specifications for food grade solvents have been drawn up and an interim report on the progress of the work on solvents was submitted to the Joint FAO/WHO Expert Committee on Food Additives. This interim report formed the basis for the final specifications presented by the Commission at the Section meetings held in September 1970. These have been submitted for publication. The Commission has been active in collating information on the estimation of lead, alkyl lead, mercury, alkyl mercury, and cadmium in foods and drawing up tentative specifications for some other food solvents. These will be discussed at the 1971 meeting.

VI.2. Fermentation Industries Section

This Section, under the Chairmanship of Dr. A. F. LANGLYKKE, has continued its activities in various phases of interest to the fermentation industries. A meeting of the Section was held in Mexico City in August 1970. The method of alcohol determination in fermented liquids previously published by the Section has met with excellent acceptance. A progress report on methods for evaluation of dry bakers yeast has been published. Some further cooperative work is required in this area in order to obviate small discrepancies and eventually lead to an internationally accepted method. The Section has devoted preliminary planning to work in the area of protein of microbial origin derived from hydrocarbons. An analysis has been made of the various problems foreseen in this field and criteria to be established and this will be further discussed at the 1971 meeting. Close cooperation with the Protein Advisory Group of WHO/UNICEF/FAO has been established. In addition, a joint meeting with the Food Section will be held at the 1971 Conference

on this topic. Progress has been made on a glossary of terms and symbols used in the fermentation literature and the preparation of a directory of research laboratories in the field of fermentation is under consideration.

This Section is cosponsoring the IVth International Fermentation Symposium to be held in Kyoto, Japan, 19-25 March 1972, and has been active in preparatory work. Sponsorship has also been granted to an International Symposium on Microbial Engineering to be held in Marienbad, Czechoslovakia, 6-10 September 1971.

VI.3. Oils and Fats Section

This Section, under the Chairmanship of Dr. E. HEINERTH, met in Stockholm in September 1970. A Working Group was established for further study of the determination of chlorinated pesticides in edible oils and fats. Further progress was made in the selection of a method of determination of *trans* fatty acid by infrared spectrophotometry. A study of melting behaviour of fats has been initiated. A large number of standard methods approved by the Section are ready for publication. These include foots in linseed oil, sterols in oils and fats, iodine value, volatile acids, di- and triunsaturated fatty acids, epoxy-group oxygen, arsenic in glycerol, unsaponified and unsaponifiables in soaps, minor quantities of glycerol in soaps, cooling curve of fats, dilatation of fats, methyl esters of fatty acids. Several methods are still in preparation, including acid value and saponification value, both by potentiometric determination, and mono-, di- and triglycerides by column chromatography. Under discussion also are methods for fat stability and Boemer value.

A change in structure and a wider scope of activity of this Section will be discussed at the Washington (1971) meeting.

VI.4. Toxicology and Industrial Hygiene Section

This Section, under the Chairmanship of Prof. R. TRUHAUT, has continued its studies on analytical methods involving toxic materials in the environment and in biological fluids such as urine and blood of exposed subjects. Six methods have been published: mercury in air, trichlorethylene in air, sulphur dioxide in air, acetone in air, mercury in urine, arsenic in urine. In addition to these, methods for 5 other compounds are in the process of being finalized. Others are in the process of critical review, including fluorine in air, sulphuric acid in air, and benzo(a)pyrene in air. Other materials under consideration include asbestos, lead, ozone, silica, carbon monoxide in blood, and the technique of indicator tubes. Consideration is being given to a large number of items for future work.

VI.5. Pesticides Section

This Section, under the Chairmanship of Dr. H. HURTIG, together with its 2 Commissions met at Erbach/Rheingau in September 1970. The Section has continued its close collaboration with FAO, WHO, OECD, Codex Committee on Pesticide Residues, CEE, and the joint FAO/IAEA programmes. An International Symposium on Pesticide Terminal Residues was sponsored in Tel Aviv, Israel, in February 1971 followed by the IIInd International Congress of Pesticide Chemistry at the same location.

VI.5.1. *Commission on Terminal Pesticide Residues*

This Commission, under the Chairmanship of Dr. H. HURTIG, has continued its close relationship with other world bodies. Good progress has been made in elucidating the terminal residues of lindane and of chlordane. Oxychlordane, an animal metabolite of chlordane, has been isolated. The metabolism of *trans*-chlordane has been studied. Further work has been carried out on metabolites of cyclodiene insecticides and certain features of structure of one of these metabolites have been confirmed by synthesis. Progress has been made on studies of terminal residues of other organochlorine compounds and of carbaryl and other carbamates. The work on dithiocarbamates is nearing completion. Progress was made also on organophosphorus compounds and in the chemical nature and distribution of the terminal residues of fumigants. Work has been completed in the terminal residues of rethrans and synergists.

VI.5.2. *Commission on Pesticide Residue Analysis*

This Commission, under the Chairmanship of Dr. R. A. E. GALLEY, has continued its collaboration with FAO/WHO and the Codex Alimentarius Commission. The recommended methods for multiresidue analysis have been endorsed by the FAO/WHO Joint Meeting of Experts on Pesticide Residues and forwarded to the Codex Alimentarius Committee on Pesticide Residues. In addition, the recommendations of this Commission relating to methods of analysis for residues of organophosphorus pesticides, fumigants, and organomercurials have also been considered. At the 1970 meeting of this Commission, analytical methods for organochlorine compounds, organophosphorus pesticides, fumigants, organomercurials, dithiocarbamates, systemic fungicides, and carbamate compounds were discussed. Some attention has been devoted to a format for describing analytical methods and their applicability. Arrangements have been made to continue to survey the fields of interest to the Commission and to consider in particular the compounds for which further analytical information was required by the 1969 and 1970 FAO/WHO Joint meetings.

VI.6. **Organic Coatings Section**

This Section, under the Chairmanship of Mr. P. H. FINK-JENSEN, met in Copenhagen in September 1970. Publication of a document entitled *Assessment of Application Properties of Brushing Paints* will be made in a specialized medium. A proposal was made for a Monograph Series which, however, could not be undertaken by IUPAC. A booklet on adhesion has been planned. Progress has been made on analytical methods for alkyd and acrylic resins.

VI.7. **Pulp, Paper and Board Section**

This Section, under the Chairmanship of Dr. K. WARD, Jr., did not meet at the XXVth IUPAC Conference, but has met twice since: in Oxford in August 1969 and in Stockholm in November 1970. The discussions revolved chiefly around joint sponsorship of various symposia to be held in Finland, Germany, USA, and Canada on subjects in the fields of carbohydrates, non-woven webs, synthetic polymers in papermaking, and wood chemistry.

VI.8. Water, Sewage and Industrial Wastes

This Section, under the Chairmanship of Dr. S. FREYSCHUSS, met in London in February 1970 and in Stockholm in November 1970. The Section organized the very successful International Congress on Industrial Waste Water held in Stockholm in November 1970. The information presented there has attracted worldwide attention. Collaboration is being established with IAWPR (International Association of Water Pollution Research), through the appointment of a representative from IAWPR as an Associate Member of the Section. Similarly, the Section has nominated one of its Members to act on COWAR (ICSU Committee on Water Research). A broad programme of activities for this Section will be established at the 1971 meeting.

W. GALLAY
President, Applied Chemistry Division

CLINICAL CHEMISTRY SECTION

Report of Chairman

The Clinical Chemistry Section and its 3 Commissions did not meet during the XXVth IUPAC Conference at Cortina d'Ampezzo in 1969. Instead, meetings were held in Geneva at the time of the VIIth International Congress of Clinical Chemistry (September 1969). Accounts of these meetings were included in *Comptes Rendus XXV Conference*.

In 1970 the Officers of the Section and its Commissions met on the occasion of the Italian Congress of Clinical Chemistry (Stresa, April). Concern was expressed at the lack of detail in the IUPAC Statutes and By-Laws with regard to functioning of Sections. The Section has nominated Dr. R. DYBKAER as its representative on the Inter-Divisional Committee on Nomenclature and Symbols. Dr. DYBKAER has also participated, on behalf of the Section, in a meeting of the IUPAC-IUB Commission on Biochemical Nomenclature at Helsinki in July 1970. The Section has been approached by IAEA about an international analytical quality control service, and it awaited with interest the deliberations of the IUPAC *ad hoc* Working Group studying the possible establishment of an International Centre for Analytical Chemistry. These deliberations were reported to the Bureau in October 1970.

The Chairman of the Section participated as a Member of an *ad hoc* Committee on an International Centre for Analytical Chemistry at a meeting held in Vienna on 12 February 1971. Also, the Chairman has received a letter from Dr. W. GALLAY, President of the Applied Chemistry Division, proposing that the measurement of toxic substances in biological fluids be made a matter of the Section's activities. The proposal has been accepted and the Section will recommend to the Bureau the appointment of a study group with a view to the formation of a Commission on Environmental Toxicology.

The Section has been informed that IUB has designated F. LUNDQUIST (Denmark) as its Correspondent to the Section of Clinical Chemistry. All collaboration in fields of mutual interest is highly appreciated by the Section and it is to propose to the Bureau to nominate Dr. DYBKAER as permanent observer to IUB.

Commission on Automation

The controversy with the Commission on Analytical Nomenclature (V.3) over *Recommended Nomenclature for Automatic Analysis* has been resolved and the report published. Meanwhile, the Commission has commenced work on a revision of its own proposals which will be considered in a revised nomenclature recommendation from IUPAC. These proposals will also form part of a wider report on automated analysis being prepared by the Commission.

The Commission has met at the following places: Geneva (4-5 September 1969), Stresa (25-26 April 1970), Birmingham (29-30 April 1971).

Dr. E. COLLOVE, a much appreciated Commission Member, died in September 1970. His manifold experience in the field of automation in clinical chemistry will be greatly missed.

Commission on Quantities and Units

There has been extensive correspondence with Commission I.1 to ensure conformity of the shortened version of IUPAC-IFCC Recommendation 1966

Quantities and Units in Clinical Chemistry with the new IUPAC *Manual of Symbols and Terminology for Physicochemical Quantities and Units*. It is hoped to publish the shortened version in the near future as an Appendix to the *Information Bulletin*. Work is continuing on new proposals for quantity descriptions relevant to clinical chemistry. The Section on Toxicology and Industrial Hygiene is participating in some work of the Commission.

The Commission met at the following places: Geneva (4-5 September 1969), Stresa (25-26 April 1970).

Commission on Teaching

Drafts of the first 4 chapters of a monograph dealing with the status of clinical chemistry throughout the world, are being evaluated by the Commission. The material to be used in preparing a fifth chapter is expected to be available shortly.

The Commission met at the following places: Geneva (4-5 September 1969), Stresa (25-26 April 1970).

M. C. SANZ
Chairman, Clinical Chemistry Section

COMMITTEE ON TEACHING OF CHEMISTRY

Report to Council

Organizational Matters

Since the last Report to Council in 1969, Prof. J. BÉNARD (France) resigned from the Committee to permit him to devote more time to his position as Vice-President of the Union. He was replaced by Prof. C. N. R. RAO (India).

In reviewing the goals of the Committee on Teaching of Chemistry it became clear to all that effective progress could only be achieved by closer cooperation between the Committee and the educators of each participating IUPAC country. In recognition of this fact a system of National Representatives to the Committee has been created. Nominations were invited from each country and some 24 countries have responded to date. The first meeting of National Representatives will be held in Washington during this Conference. It is hoped that this meeting will provide the Committee with much needed advice and will help to make our work more effective and more widely known throughout the world.

Activities

A. *Symposia.* The Committee and Consiglio Nazionale delle Ricerche of Italy jointly sponsored a Symposium on University Chemical Education in October 1969 in Frascati. This was an outstanding success, bringing together chemists from many countries to discuss trends in undergraduate chemistry programmes, research organization, and relationships between university and industrial chemistry. Proceedings were published. Financial support for the meeting was generously provided directly or indirectly by several organizations including the Royal Society, UNESCO, ACS Petroleum Research Fund, Camille and Henry Dreyfus Foundation, US National Science Foundation, Italian Chemical Society, Istituto di Chimico dell'Università di Roma, as well as Consiglio Nazionale delle Ricerche of Italy and IUPAC.

A similar meeting is being arranged under IUPAC sponsorship in Sao Paulo, in August-September 1971, to discuss chemical education developments at university level with special reference to countries in Latin America.

The Committee also participated in the Jubilee meeting of the ACS Division of Chemical Education in July 1970 in Aspen, Colorado, in which one of the main working groups was concerned with international chemical education. Arising out of this conference were several recommendations for development of chemical education throughout the world. Specifically, the role of the IUPAC Committee as a coordinating agency for such developments was strongly advocated.

B. *Publications.* The report of the International Workshop on *Evaluation in Chemistry*, held in Ceylon in August 1968, was published jointly by the Committee and UNESCO in 1969.

The proceedings of the Frascati Symposium have been published in *Pure and Applied Chemistry* **22**, 1-212 (1970) under the title *University Chemical Education*.

The report of the Aspen Conference was published in *Journal of Chemical Education* **48**, 2-38 (1971).

C. *Collaboration with UNESCO.* The Committee has maintained its liaison with the UNESCO Division of Science Teaching and, in addition to the collaboration in connection with the Frascati Symposium, it is preparing on behalf of UNESCO a survey of trends in university chemical education. It is hoped that this survey, which will be based on articles from more than 20 countries, will be published later in 1971.

It has also been involved in advising UNESCO on the series *New Trends in Chemistry Teaching* and on evaluation of the Pilot Project in Chemistry Teaching in Asia.

Future Programme

Discussions during the 1971 IUPAC Conference and at a recent UNESCO Advisory meeting will serve to focus the Committee's attention on a number of problems in chemical education which might be studied and on the possibility of major meetings every 4-6 years to survey trends in chemical education on a worldwide basis. The involvement of National Representatives in a network of coordination and dissemination of information on chemical education is likely to be a major feature of the Committee's programme in the years ahead. Already one such effort has been made in connection with the pre-service and in-service training of chemistry teachers. This topic has been under discussion by the Committee for some years and a report, with recommendations, was published in *Information Bulletin* No. 31 (March 1968). Since then the National Representatives have been responding to a questionnaire on the subject and the responses are being considered at the meeting of the Committee with National Representatives during the present Conference.

The extent to which the Committee can become involved in executing actual programmes rather than providing advice to others is limited by finance and manpower. Even the modest executive action undertaken in connection with meetings such as the Frascati Symposium and the collation of replies from National Representatives on teacher training would be difficult without the substantial assistance of the IUPAC Secretariat and the Committee wishes to record its appreciation of this support.

R. W. PARRY
Chairman, Committee on Teaching of Chemistry

REPORT ON PUBLICATIONS

At the meeting in Cortina d'Ampezzo two years ago, I gave a short account of the history of the publications policy of IUPAC, and mentioned points of current importance. For the benefit of those not familiar with the details, I would like to survey the progress briefly, and mention the main decisions taken at a meeting of the Committee on Publications here last week.

Fourteen years ago, at the Paris meeting of 1957, much concern was expressed that the important work of the Union and of its Commissions was not being disseminated as widely as it should have been, and that there was no coherent and uniform policy for achieving this service to chemists at large. As a result, a commercial publisher was appointed for the Union, and during the following two years, a number of reports and nomenclature rules were issued under the Union's name with encouraging success.

At Munich in 1959, it was decided to start a new journal of *Pure and Applied Chemistry*, in which all the reports of Commissions, nomenclature rules, and the main lectures at symposia sponsored by the Union would be brought together. This was, of course, an unusual kind of journal, covering the full range of chemistry. Therefore, in order to provide for those readers or organizations who would not wish to purchase the journal itself, arrangements were made to sell offprints of separate articles, reports, or symposia as bound books. This arrangement made it possible to sign a contract with the publisher, at no financial risk to the Union, and with the possibility of financial gain. Later, in order to deal with important scientific material which, for one reason or another, was less fitting to the journal, supplementary volumes have been published.

The first volume of the journal appeared in 1960. At the end of this year, 1971, 28 volumes will have been completed. Up to 1969 there were two volumes in each year, in 1969 there were three, and for each of 1970 and 1971 there will be four. Actually, 1971 should be a remarkable year for IUPAC publications, for a small backlog from 1970 was first cleared, four volumes of the journal for 1971 will be published, as well as several supplementary publications, the total being the equivalent of about eight volumes of the journal in one year. In addition, eight volumes of the collected main lectures at the Boston Congress will be issued later this year. We are up to date with our publication schedule and the papers at several symposia should be published reasonably soon after they have taken place.

We intend to publish four volumes of the journal in 1972, but it will be necessary due to increased printing costs to raise the subscription rate by about 10%. From the journal, or as supplements, there have been so far about 75 separate bound offprints, of which two have sold more than 3,000 copies, about twenty-five have sold more than 1,000 copies, and several of them about 2,000 copies. At present there are more than 1,250 regular subscribers to the journal itself, so that taken together with the separate book sales, the numbers can be regarded as good, although of course we hope that they will rise even higher.

Royalties received by the Union in 1970, after payment of tax, amounted to about \$17,500, and over the past six years the total net income to the Union has been about \$72,000, and it is steadily rising.

I should draw your attention again to three especially important publications, either already issued or about to be issued, which we have called the Red, Blue, and Green Books. The Red Book is the Nomenclature Rules of Inorganic Chemistry (2nd edition), the Blue Book is the collected Nomenclature Rules of Organic Chemistry, Parts A, B, and C (3rd edition), and the

Green Book is the Manual of Symbols and Terminology for Physicochemical Quantities and Units. We hope to arrange for special publicity to be given to these publications in chemical news journals, and in other ways.

The *Information Bulletin* was started by Dr. MORF some fifteen years ago, as a means of drawing attention to IUPAC business not covered by the journal or *Comptes Rendus*. Two years ago, in view of the increasing amount of general information to be circulated, the need to have a more systematic production schedule, and the facilities available in the new Secretariat, it was decided to transfer the compilation, production, and distribution of the Bulletin to the Secretariat. Results have now shown that the costs were thereby reduced, and in addition the rapidly increasing demands for regular subscriptions to purchase the Bulletin indicate that this policy was correct.

Two other related actions have proved successful. We decided at Cortina d'Ampezzo to publish *tentative* nomenclature rules as appendices in the same format as the Bulletin but on yellow paper; and various technical reports which are less appropriate to the journal similarly on blue paper. A number of these appendices have appeared during the past two years. The present indications are that the Bulletin and its appendices will command a greater and more widespread interest, and provide a small new source of income to the Union. Some care will be needed here, for as the Treasurer has told you already, it may become impossible, as the volume of our publications increases, to give out so many free copies without increasing the rates for subscription to the Bulletin, or for the Company Associates. We feel that, as from 1972, extra charges should be made for the distribution of the Bulletin by air mail.

We also intend to send copies of the Bulletin and appendices for review in the chemical news journals, and to submit to the latter short statements in advance about impending developments.

For many years the Bureau of IUPAC has acted as Advisory Board for its journal *Pure and Applied Chemistry*. A separate Committee on Publications was appointed two years ago, to consider broader aspects of publications policy, and it includes several editors of national chemical journals. This Committee has given thought to the future content and use of the *Information Bulletin*, to the publication policy in regard to joint symposia, to new methods for obtaining a quicker distribution of scientific material, to questions of selectivity in our publications, and to many other matters. Between 1969 and 1971 the Union has given its sponsorship to no less than 36 symposia, and it is obvious that some selectivity is becoming necessary.

The day-to-day problems are usually settled by Prof. WEEDON, Prof. CULLIS, and myself in consultation with the Secretariat, and frequent discussions are held with the publisher.

As some of you may know already, we are making an experiment with the symposia which are to be held at the IUPAC Congress in Boston next week. About 20 symposia have been divided into 8 groups of scientifically related topics, and the main lectures in each of them will be published as volumes in the same format by photooffset (lithography), selling at \$7.50-18.00 per volume, and to be ready three months after the meeting. If this experiment succeeds, it may be a valuable pointer to future policy. Order forms for these publications will be available in Boston.

I should be less than frank if I did not mention some of the difficulties which we have faced with regard to IUPAC's publications. There have been complaints about delays in publishing some of the symposia. Almost always these have been caused by the failure of one (or more) contributor to deliver

his manuscript until long after the meeting. If, in order to publish at once, one or two key lectures have to be omitted, it often creates an unbalanced presentation, and to await them also affects a carefully preplanned publication programme and leads the publisher into a confused situation. Some authors supply slides as diagrams, which have to be redrawn. Others send no abstract for their paper. Sometimes, too, considerable alterations are made in proof and even alterations to diagrams, and this leads to expensive resetting of type and to delays, which ought to be avoided.

We have received much help in recent years from the Presidents of Divisions, from the organizers of symposia, and especially from the editors appointed for these symposia, and this has been greatly appreciated. We hope that we may continue to get this assistance.

The Union must continue to reserve its first right to publish lectures at any of the symposia which it sponsors, and this indeed is a part of the favourable contract made with its publisher who must be allowed to get the good as well as taking the less good. However, we have waived our rights to publication on several occasions, when special factors were involved. We have also, more often than not, given up our publication rights for joint symposia with other organizations. This seems to me to be a difficult matter, for the publication of some of these interdisciplinary discussions might bring great credit to the Union, and IUPAC should not always be the loser.

As I explained two years ago, the publisher some time ago allowed us to revise the contract, so that essential standard material such as the table of atomic weights or nomenclature rules could, with almost no restriction, be reprinted or translated in any language, if the proper arrangements are made. Recently, also, the publisher has generously agreed to modify our contract so that the publication of nomenclature rules prepared jointly between IUPAC and another Union should be a matter for a separate arrangement. I believe that in this connexion we can now make a very satisfactory arrangement with IUB for the forthcoming report on enzyme nomenclature.

Recently, problems have arisen with regard to some reports from Sections in the Applied Chemistry Division. It is sometimes argued that special reports, or the main lectures at symposia sponsored by the Union, could be published more advantageously in specialist journals which deal with applied chemistry. Ultimately, this problem can only be settled by the Executive Committee or Bureau, but if we are to have general rules I think that they must be maintained, in a benevolent and imaginative kind of way; and at a time when IUPAC is trying to emphasize its interest in applied chemistry, it would be unfortunate not to include among its publications the best fruits of its work in this field.

Some time ago, we published the excellent pamphlet by Past-President KLEMM on the work of IUPAC (1957-1967). At the request of the Committee on Publications and Executive Committee, I have now written a short and more general account of what IUPAC is, and does, to update that prepared many years ago by an earlier President, Prof. NOYES. Some changes still have to be made, for example, in regard to the changes in structure being proposed for the Applied Chemistry Division. This document will then be seen by the Executive Committee and arrangements made for its dissemination.

I feel sure that the publication system of the Union is evolving well. Those who work in its Commissions can feel satisfied and rewarded by the dissemination of their conclusions among colleagues everywhere, and this is bringing credit to the Union.

We owe a great, and continuing debt to the Scientific Editor Prof. WEEDON,

and his assistant Prof. CULLIS, and to the great work of Dr. WILLIAMS and Mr. GUJRAL in the Secretariat. All have worked hard and cooperated on this difficult task. We have also received sympathetic and generous consideration of our problems from Butterworths, our publisher.

H. W. THOMPSON

MINUTES OF XXVI COUNCIL MEETING

21 and 23 July 1971

Present: Dr. A. L. G. REES (President, in the Chair), Members of Bureau, Delegates of National Adhering Organizations, Delegates of Associated Organizations and of International Union of Biochemistry.

All statutory actions necessary for convening a meeting of Council had been taken through the following letters:

re. Official invitation to National Adhering Organizations, 23.10.70 (1600/RR/CAD/70) and 11.12.70 (1870/RR/LPL/70)

re. Official invitation to Associated Organizations, 25.1.71 (171/MW/MG/71)

re. Members of IUPAC Bodies, 30.9.70 (1468 and 1469/RR/CAD/70), 11.11.70 (1802/RR/LPL/70) and 11.12.70 (1871/RR/LPL/70)

re. Nomination of Candidates for Elections (Officers and Bureau), 30.11.70 (ALGR/JFW) and 12.1.71 (3/RM/MW/MG/71)

re. Announcement of Candidates for Elections (Officers and Bureau), 25.5.71 (838/RM/MW/MG/71)

re. Draft Council Agenda, 12.1.71 (3/RM/MW/MG/71)

re. Final Council Agenda, 19.3.71 (398/MW/MG/71)

re. Documentation available for Council Agenda Items, 30.4.71 (644/MW/MG/71), 25.5.71 (838/RM/MW/MG/71) and 16.6.71 (905/MW/MG/71)

Minute 1 Introduction

In his opening remarks Dr. REES first paid tribute to the colleagues deceased since the last Conference: R. ADAMS, J. H. DE BOER, R. BRDIČKA, G. CENTOLA, J. A. CHRISTIANSEN, W. E. COHEN, E. COTLOVE, L. ERDEY, F. FEIGL, G. GORBACH, E. A. GUGGENHEIM, K. HELHOLT, V. KARGIN, S. S. MEDVEDEV, J. PACKER, W. SCHÖNIGER, C. SCHÖPF, M. M. SHEMYAKIN, L. SILLÉN, A. STOLL, O. WARBURG, F. WEYGAND.

Attention was drawn to the two voting procedures permitted in Council (By-law 2):

on *scientific matters*, by Delegates of National Adhering Organizations acting individually, via a paper ballot or on a show of hands

on *nonscientific matters*, by each National Delegation holding up a card showing the number of votes appropriate to its Category of Membership.

Sir DAVID MARTIN (UK) and Dr. M. A. PAUL (USA), the only Secretaries to National Delegations, were elected as Tellers for the duration of the meeting.

Minute 2 Finalization of Agenda

No matters of urgency (By-law 2.25) needed to be added to the agenda circulated four months before the meeting by registered mail as required by statute.

Minute 3 Minutes of XXVth Council Meeting

The minutes of the previous Council Meeting, as circulated to the National Adhering Organizations and as printed on pages

54-63 of *Comptes Rendus XXV Conference*, were approved by the National Delegations.

Minute 4 Nominations for Officers and Bureau Members

The files for the meeting contained the nominations received by the statutory deadline, together with biographical notes on each candidate, for vacancies amongst the Officers and Elected Members of the Bureau. An official letter, withdrawing his nomination, had been received from Prof. GLEMSER.

On the recommendation of the Bureau and taking into account the present financial position of the Union, it was *Resolved* (Statute 7.2) on a vote (107 in favour; 0 against):

that there be 11 Elected Members of the Bureau for the period 1971-73, so that 4 vacancies would now exist.

In accordance with By-law 2.222, the Bureau had discussed (Minute 98, XXVII/B) the nominations made by the National Adhering Organizations. It had exercised the right to make an additional nomination and to make recommendations to Council for filling the various vacancies.

Minute 5 Time of Elections

The President announced that the elections would be held at 10.00 on 23rd July. Council accepted the recommendation of the Bureau that the procedure for election of Elected Members of the Bureau should be that adopted at the XXVth Council Meeting (Cortina d'Ampezzo, 1969).

Minute 6 Report of President on State of Union

Dr. REES referred to his printed report which had been pre-circulated, emphasizing

- the need for increased income, especially governmental support on a continuous funding basis
- the confrontation of chemistry with many interdisciplinary problems, which IUPAC was tackling in a collaborative spirit
- the unsatisfactory position of applied chemistry in the Union, which had led to proposals for reorganization of the Applied Chemistry Division
- the increase in scientific activity of the Union, as evidenced by the growth in the IUPAC publications programme
- the establishment of the ICSU Special Committee on Problems of the Environment (SCOPE) and IUPAC participation in its work
- IUPAC's role in promoting chemistry through an increasingly large number of international and regional symposia receiving its sponsorship.

The report was accepted unanimously without discussion.

The President expressed special votes of thanks to Prof. VERKADE, active in IUPAC nomenclature affairs since 1922, and to Mr. ARNOLD who had retired recently as Chairman of the Finance Committee. These thanks were endorsed by Council in the traditional manner. On behalf of Council Dr. REES expressed

to its US hosts, appreciation of the generous contribution of \$30,000 towards the expenses of the XXVIth Conference, for their hospitality, and for the provision of secretarial assistance.

Minute 7 Biennial Report of Treasurer

The report of the Treasurer and the audited accounts for 1969–70 had been circulated before the meeting in printed form. In 1969 there was an excess of expenditure over income of \$59,302.76, but in 1970 an excess of income over expenditure of \$36,257.87 had been achieved. Prof. BAILAR briefly drew Council's attention to

- the new activities undertaken since the XXVth Conference and inflation, which had not been counterbalanced by increasing income
- the need for all National Adhering Organizations to recruit new Company Associates and to urge larger industrial organizations to subscribe for increasing numbers of units
- the Bureau's decision to ask Company Associates, starting in 1972, to pay half of the subscription cost to *Pure and Applied Chemistry*
- the hope that other National Adhering Organizations would find it possible to move to higher membership categories, as in the case before Council for USSR to advance from Category A1 to A3
- the rising income from royalties on IUPAC publications
- the payment of part of the expenses of their Titular Members to the biennial Conference by some National Adhering Organizations

Finally, thanks were expressed to Schweizerische Bankgesellschaft, especially to Mr. H. BAUMANN and Dr. J. RAKOWSKY, for the excellent and generous service provided to the Union.

Resolved:

that the Treasurer's biennial report and the audited accounts for 1969–70 be accepted.

Minute 8 Report of Finance Committee

The Chairman, Dr. J. W. BARRETT, pointed out that although the report in the Council file was brief, it represented a great deal of work on behalf of IUPAC. The capital assets at present had a value of about \$270,000; the gold brick long held by the Union had been sold and the proceeds reinvested. Dr. BARRETT emphasized the need for exercising the greatest care in financial expenditure over the next few years. Attention was also drawn to the Finance Committee's interest in improving membership of the Company Associates Scheme; to proposals before Council for a revised scheme of annual subscriptions from National Adhering Organizations; and to a restatement of the Committee's Terms of Reference, Composition, and Terms of Office of Members.

The report was adopted by Council without discussion.

Minute 9 National Adhering Organizations

An application from Comision Nacional de Investigacion Cientifica y Technologica of Chile to become the National Adhering

Organization of IUPAC already had the support of the Executive Committee and Bureau. It was *Resolved* on a vote (127 in favour; 0 against):

that Comision Nacional de Investigacion Cientifica y Tecnologica be admitted to Category B1 membership of IUPAC, and that the question of arrears of annual subscriptions of a former Adhering Organization from Chile not be considered.

On the recommendation of the Bureau, Council *Resolved* with acclamation:

that an application from the USSR National Adhering Organization to change its Category from A1 to A3, retrospective to 1970, be accepted.

Minute 10 Associated Organization Status

The President reminded Council that the *ad hoc* Committee on Interdisciplinary Matters had encouraged contacts to be made with other organizations and especially to bring appropriate bodies into Associated Organization status of IUPAC. An application for this status from the International Magnetic Resonance Society had the support of the Executive Committee and Bureau and was in the Council file. It was approved without objection.

Three further applications had been considered by the Executive Committee and Bureau during the XXVIth Conference and they were recommended for acceptance by Council:

European Photochemistry Association
Comité International des Dérivés Tensio-Actif (CID)
Federation of European Chemical Societies

In answer to a question from the Israel Delegation, Dr. REES said it was existing policy to admit regional as well as international bodies as Associated Organizations. The three further applications were then approved without objection.

Minute 11 Budget Estimates for 1972 and 1973

Dr. Barrett informed Council of the Finance Committee's suggestions of means of achieving a reduction in the expenditures envisaged in the budget estimates for the next biennium. Subsequent amendments to the budget estimates, proposed by the Executive Committee, had been endorsed by the Bureau. These amendments led to a total saving of \$37,900 for 1972 and of \$20,900 for 1973 on the estimates in the Council file. Further slight amendments would arise as a result of elections to IUPAC bodies during the XXVIth Conference.

During discussion of the amended budgets by Council, the following points were made:

- the possibility of adding a IUPAC surcharge of \$5–10 to the registration fee of all meetings receiving its sponsorship
- the hope that distribution in 1972 to IUPAC bodies of the *Information Bulletin* by surface mail only would be a temporary measure
- the reduction in Contingency Funds was detrimental to efficient working of the Divisions.

Resolved:

that the budget estimates for 1972 and 1973, as amended by the Executive Committee (Minute 568, LXX/EC), be approved.

Minute 12 Dues Structure

Mr. P. M. ARNOLD, former Chairman of the Finance Committee, presented its revised proposals for a scheme of annual subscriptions for National Adhering Organizations, based on chemical turnover in the respective countries. The *Standard International Trade Classification* of the United Nations could be used to define industries which should be included in 'chemical turnover'. The proposals led to a reduction of one in the present number of categories. In addition, Category D should be regarded as an entrance category, with Category C the starting point for a unit payment of \$400.

Attention was drawn to the following points

- each National Adhering Organization remained free to decide which membership category it would occupy
- contributions paid directly into the general funds of IUPAC from sources like Company Associates, might be added to the payment made by an Adhering Organization, the sum to constitute the annual subscription of that country
- the hope that some countries, as in the past, would contribute a larger sum than the minimum subscription for the categories they occupied.

There was no support for a suggestion from the USSR Delegation to base annual subscriptions on the extent of Titular Membership of each country in IUPAC bodies.

Resolved on a vote (116 in favour; 6 against):

that the Finance Committee's proposals for revision of annual subscriptions from the National Adhering Organizations be approved and introduced in 1972.

Minute 13 Annual Dues for 1972 and 1973

The President declared this item superfluous in view of the resolution carried on revision of annual subscriptions from the National Adhering Organizations (see Minute 12).

Minute 14 Reports of Division Presidents and Clinical Chemistry Section

The Division Presidents and the Chairman of the Clinical Chemistry Section referred briefly to their precirculated reports of activity since the XXVth Conference, then informed Council of the further progress made during the XXVIth Conference.

Prof. GLEMSER reported that the Commission on Nomenclature of Inorganic Chemistry had reiterated the view that elements 104 and 105 should not be named until 5 years after the initial announcement of their discovery; it did not wish to make a choice of name before mid-1973 at the earliest. For elements beyond 105, the Commission favoured the adoption of a systematic nomenclature devised in advance.

Prof. OURISSON reported that steps had been taken during the XXVIth Conference to remedy difficulties encountered in organizing the work of the Commission on Organic Photochemistry. After extensive discussion, it had been decided to make the following observations and recommendations to Council:

- (i) The Organic Chemistry Division regrets to see an unnecessary proliferation of journals devoted to publication of the organic chemical literature.
- (ii) The Organic Chemistry Division recommends that titles and summaries should be written in such a way as to facilitate information retrieval by including all the important keywords.
- (iii) The Organic Chemistry Division proposes for consideration by the appropriate authorities that when a *preliminary communication* is submitted, it should be accompanied by a fully detailed experimental section which would be available to the referees, but which would not be published. In addition, a copy of this experimental section would be available on payment of an appropriate sum to the publishing journal or to the author.

Council agreed that these observations and recommendations should be circulated to the National Adhering Organizations for consideration of action at a national level.

Resolved:

- (i) that all existing Sections, Commissions, and Sub-Commissions of the Physical Chemistry, Inorganic Chemistry, Organic Chemistry, Macromolecular, and Analytical Chemistry Divisions and of the Clinical Chemistry Section be allowed to continue for two more years;
- (ii) that IUPAC conveys to the XIVth Conférence Générale des Poids et Mesures its earnest hope that the XIVth Conférence Générale, will adopt, without amendment, the draft resolution on the mole presented to it by the Comité International des Poids et Mesures;
- (iii) that changes in atomic weight value for 10 elements recommended by the Commission on Atomic Weights during the XXVIth Conference be approved;
- (iv) that the use of metallic gold, silver, and cadmium as standards for testing apparatus and procedures for vapour-pressure measurement, proposed by the Commission on High Temperatures and Refractories, be approved;
- (v) that a change in title from 'Commission on High Temperatures and Refractories' to 'Commission on High Temperatures and Refractory Materials' be approved;
- (vi) that a change in title from 'Commission on Chemical Plant Taxonomy' to 'Commission on Chemical Taxonomy', enabling the Commission to extend its coverage to animals and to enhance interdisciplinary collaboration with other bodies, be approved.

Dr. GALLAY reported on proposals for reorganization in the structure of the Applied Chemistry Division. Since it was impracticable for the Division to cover even a reasonable proportion of the important chemical technologies, it was deemed advisable to concentrate on problems relating to human welfare, particularly food and the environment. Six of the present eight Sections should be retained, though with changes in emphasis in some cases. A new Section was suggested to work on reclamation of solid wastes.

Dissolution of the Sections on Organic Coatings (VI.6) and on Pulp, Paper, and Board (VI.7) was proposed. Although Section VI.6 claimed to be fully representative internationally of the industry, it did not fit into the revised structure for the Division as a whole. No viable and worthwhile programme had been developed by Section VI.7. The Macromolecular Division had offered to absorb from Sections VI.6 and VI.7 any existing activities appropriate to it; however, that Division did not itself wish to establish technological bodies of any sort. To facilitate any transfer of activities, the present Officers alone of the two Sections should remain for up to one year after the XXVIth Conference.

An extended discussion took place on the proposal to dissolve the Section on Organic Coatings, in which the Delegations from Denmark, Sweden, UK, Switzerland, and Hungary participated. The following Resolution, drawn up by the President of the Applied Chemistry Division and the Chairman of the Section on Organic Coatings, was put to Council:

that the Section on Organic Coatings of the Applied Chemistry Division continues its activities until the end of the XXVIIth Conference in order to finalize its work and to terminate the Section as part of the Division, it being understood that during this two-year period every effort will be made by the Division, Section, and all others concerned to explore other forms of incorporation of this group, preferably as an entity, within the IUPAC structure.

An Amendment to the Resolution, introduced by the Netherlands Delegation and proposing deletion of the words 'in order to finalize . . . part of the Division', was defeated on a vote (51 in favour; 60 against). The unchanged Resolution was then carried on a vote (94 in favour; 6 against). Subject to this amendment, the proposals for reorganization in the structure of the Applied Chemistry Division were approved by Council.

The German Delegation was of the opinion that the reorganization of the Applied Chemistry Division did not improve the position of applied chemistry in IUPAC. Its suggestion that working parties of short duration be set up to investigate how appropriate specific matters in applied chemistry might be covered by the Union, was noted by the Officers of the Applied Chemistry Division.

Minute 15 Committee on Teaching of Chemistry

The printed report of the Committee on Teaching of Chemistry was included in the Council file. Its Chairman, Prof. R. W. PARRY,

referred to the creation of a system of National Representatives to the Committee, 24 countries having responded to date. He urged the other 19 National Adhering Organizations to nominate Representatives as soon as possible. Attention was drawn to the Symposium on University Chemical Education (1969) and the Jubilee meeting of the ACS Division of Chemical Education (1970), in both of which the Committee had participated, and to the publications arising from these meetings. Collaboration with the UNESCO Division of Science Teaching was continuing on various projects. Council approved the report without discussion.

Minute 16 Report on Publications

Sir HAROLD THOMPSON announced that all issues of *Pure and Applied Chemistry* outstanding from previous years had been cleared, nearly half of those scheduled for 1971 were already published and the remainder should be completed by the end of the year. Several supplements had also been processed, constituting a tremendous effort for all concerned. In view of rising costs of printing, it was necessary to recommend that the subscription to the journal in 1972 be increased to \$40.50 (£13.50) per volume, with a corresponding change in the pricing of reprints and supplements. After deduction of tax, royalties from Butterworths for 1970 amounted to about \$17,500. The policy of appointing a Symposium Editor to deal with the papers to be published from a IUPAC-sponsored meeting was beginning to show real benefits.

Transfer of the compilation, production, and distribution of the *Information Bulletin* to the Secretariat was improving the efficiency and reducing costs. Publication of tentative nomenclature recommendations as appendices to the Bulletin (yellow booklets) had proved to be very successful; a new series of technical report appendices (blue booklets) also seemed promising. The number of paid subscribers to the Bulletin was increasing satisfactorily and would provide a small new source of income to the Union. It would be necessary to charge extra in 1972 for those wishing to receive the Bulletin by air mail. However, this should be offset by abstracting important items in advance of publication and distributing the information to the main chemical news journals. Arrangements made in 1969 for reprinting final nomenclature recommendations should be allowed to continue.

A new report on Enzyme Nomenclature would be available shortly from the IUPAC-IUB Commission on Biochemical Nomenclature. Earlier versions had been published by Pergamon (1961) and Elsevier (1964), so Sir HAROLD THOMPSON thought the new report could be considered as final (definitive) recommendations by IUPAC. He suggested that, subject to the agreement of IUB, the report be offered for publication by Butterworths under the joint imprint and copyright of the two Unions.

Revision of the earlier pamphlet 'IUPAC—What it is—What it does—How it works—How it is financed', was complete except for the reorganization in structure of the Applied Chemistry Division. Financial implications of its publication would need consideration by the Bureau (Executive Committee). There had been some criticism that the Union seldom waived its rights of

publication for symposia sponsored by IUPAC. An analysis showed that IUPAC had, in fact, been increasingly generous in this respect: the situation would need careful watching, since some important material was being allowed publication outside the Union. It was essential for the Committee on Publications to meet in 1972 to review the important experiment of publishing by photooffset, within three months, material from the XXIIIrd IUPAC Congress.

In discussion of the report, the German Delegation enquired what expenditure of the Union on publications was not absorbed by Messrs. Butterworths. Sir HAROLD THOMPSON replied that the matter would need investigation, but he believed there to be an overall financial surplus on IUPAC publications.

Resolved:

that, in receiving the report on publications, a vote of thanks from Council be recorded for the hard work done by Sir HAROLD THOMPSON (Chairman of Committee on Publications), Prof. WEEDON (Scientific Editor), his assistant Prof. CULLIS, and the staff of the Secretariat. The sympathetic and generous consideration of IUPAC's problems by Butterworths is also acknowledged.

Minute 17 Adoption of Nomenclature Rules

The meeting file contained a list of tentative recommendations on nomenclature, symbols, units, and standards which had been approved by correspondence through the Executive Committee since the XXVth Conference. These tentative recommendations were ratified by Council.

On the proposal of the relevant Division President, the following final (definitive) recommendations on nomenclature, symbols, units, and standards were approved by Council:

- (i) Catalog of Physicochemical Standard Substances (Commission on Physicochemical Measurements and Standards) (tentative version: Appendix No. 2 to *Information Bulletin*, December 1969)
- (ii) Manual of Definitions, Terminology, and Symbols in Colloid and Surface Chemistry (Commission on Colloid and Surface Chemistry) (tentative version: Appendix No. 3 to *Information Bulletin*, December 1969)
- (iii) Recommendations for Presentation of NMR Data for Publication in Chemical Journals (Commission on Molecular Structure and Spectroscopy) (tentative version: Appendix No. 4 to *Information Bulletin*, January 1970)
- (iv) Nomenclature of Boron Compounds (Commission on Nomenclature of Inorganic Chemistry) (tentative version: Appendix No. 8 to *Information Bulletin*, September 1970)
- (v) Collective Names for Groups of Elements (Commission on Nomenclature of Inorganic Chemistry) (tentative version: *Comptes Rendus XXV Conference*, page 112)
- (vi) Cyclitol Nomenclature (IUPAC-IUB Commission on Biochemical Nomenclature and Commission on Nomenclature of Organic Chemistry) (tentative version: *Information Bulletin* No. 32, August 1968)

- (vii) A One-letter Notation for Amino Acid Sequences (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 32, August 1968)
- (viii) Nomenclature of Steroids (IUPAC-IUB Commission on Biochemical Nomenclature and Commission on Nomenclature of Organic Chemistry) (tentative version: *Information Bulletin* No. 33, December 1968)
- (ix) Nomenclature of Organic Chemistry, Section E: Fundamental Stereochemistry (Commission on Nomenclature of Organic Chemistry) (tentative version: *Information Bulletin* No. 35, June 1969)
- (x) Nomenclature for Vitamin B₆ and Related Compounds (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: Appendix No. 6 to *Information Bulletin*, September 1970)
- (xi) Carbohydrate Nomenclature-1 (IUPAC-IUB Commission on Biochemical Nomenclature and Commission on Nomenclature of Organic Chemistry) (tentative version: Appendix No. 7 to *Information Bulletin*, September 1970)
- (xii) Nomenclature Rules for Corrinoids (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 26, August 1966)
- (xiii) Recommendations for Nomenclature of Synthetic Modifications of Natural Peptides (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 27, December 1966)
- (xiv) Abbreviated Nomenclature of Synthetic Polypeptides (Polymerized Amino Acids) (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 30, October 1967)
- (xv) Recommendations on Ion-Exchange Nomenclature (Commission on Analytical Nomenclature) (tentative version: Appendix No. 5 to *Information Bulletin*, January 1970)
- (xvi) Nomenclature, Symbols, Units, and their Usage in Spectrochemical Analysis-I (Commission on Spectrochemical and Other Optical Procedures for Analysis) (tentative version: Appendix No. 1 to *Information Bulletin*, December 1969)

Minute 18 Bureau Proposals for New Units

Following the recommendations of the Bureau, which had been distributed to all Delegates, Council *Resolved*:

- (i) that having regard to the help received from the Committee on Congress Organization and Programmes in the past and to the present financial status of the Union, this Committee be dissolved. Reports on experiences gained at IUPAC Congresses should continue to be deposited in the Secretariat, and the Secretary General should be available to give advice as necessary in the future.
- (ii) that the Panel of Experts from IUPAC, drawn up by the Bureau in 1969, be reconstituted as a Committee on SCOPE, attached to the Bureau, but without financial commitment to the Union. The composition of the Committee is:

Dr. W. GALLAY, Chairman (Canada)
Dr. H. EGAN (UK)
Mr. J. L. MONKMAN (Canada)
Prof. R. TRUHAUT (France)
Prof. P. W. WEST (USA)
Prof. G. WIDMARK (Sweden)

- (iii) that the work of the Section on Oils and Fats be reorganized under the Section through the establishment of a Commission on Oils and Fats and a Commission on Soaps and Oleochemicals, with no increase in Titular Members above those of the parent Section.
- (iv) that a Committee on Statutes and By-laws be established with Sir DAVID MARTIN (UK) as Chairman. The Committee should be attached to the Bureau and its composition recommended by the Chairman to the President of the Union, who will appoint the other Members.
- (v) that a Sub-Commission on Mass Spectroscopy be established and attached to the Commission on Molecular Structure and Spectroscopy of the Physical Chemistry Division. One Titular Member of the Commission should be a specialist in mass spectroscopy and he should make recommendations on the composition of the Sub-Commission.
- (vi) that an *ad hoc* Committee be appointed to study the need for a Joint Commission of IUB, IUPAB, and IUPAC, to undertake a critical compilation of thermodynamic data of biochemical processes and reactions. The composition of the Committee should be recommended by consultation between the three Unions.
- (vii) that an *ad hoc* Committee of three persons be appointed to study the need for a Section on Reclamation of Solid Wastes, the composition of the Committee to be recommended by the President of the Applied Chemistry Division.
- (viii) that an *ad hoc* Committee of three persons be appointed, without financial commitment to IUPAC, to study the need for a Commission on Clinical Toxicology. The composition of the Committee should be recommended by the Chairman of the Clinical Chemistry Section.
- (ix) that an *ad hoc* Committee of three persons be appointed, without financial commitment to IUPAC, to study the need for a Commission on Molecular Characterization of Polymers. The composition of the Committee should be recommended by the President of the Macromolecular Division.

Minute 19 *Ratification of Decisions taken by Bureau and Executive Committee*

All decisions taken by the two bodies since those approved by Council at the XXVth Conference, were contained in the Minutes of the XXIIIrd-XXVIth Bureau and LXVth-LXIXth Executive Committee meetings. These Minutes had been circulated to all Delegates.

Resolved:

that the decisions taken by the Bureau and Executive Committee since the XXVth Conference be ratified.

Minute 20 Location of Official Headquarters

On the recommendation of the Executive Committee and Bureau,
Council *Resolved*:

that the Official Headquarters of the Union continue to be located in the Canton of Zürich for the next four years.

Minute 21 Language for Official Records

On the recommendation of the Executive Committee and Bureau,
Council *Resolved*:

that the Language for Official Records of the Union continue to be English for the next four years.

Minute 22 Elections

The President reported the reason for convening an extraordinary meeting of the Bureau prior to the assembly of Council on 23rd July. The recommendations of the Bureau (Minute 114, XXVIII/B) had subsequently been circulated in written form to all Delegations.

Resolved on a vote:

- (i) that the Resolution (see Minute 4) for there to be 11 Elected Members of the Bureau for the period 1971-73 be rescinded (98 in favour; 0 against);
- (ii) that there be 12 Elected Members of the Bureau for the period 1971-73, so that 5 vacancies would now exist (120 in favour; 0 against).

Council noted the Bureau's recommendation for filling the additional vacancy. In answer to a question from the Swiss Delegation, Dr. REES confirmed that the Bureau's recommendation for filling the various vacancies were not binding on the Delegations.

Dr. MORF announced his withdrawal from nomination for the Office of Secretary General. In view of the creation of the Secretariat, the German Delegation suggested it might not be necessary to continue the Office of Secretary General. Dr. REES advised that this matter be referred for the attention of the new Committee on Statutes and By-laws.

Present:

31 Delegations with a total of 134 votes, plus Brazil which was deprived of its voting rights because of being in arrears with its annual subscriptions for 2 years (Statute 9.2).

Vice-President:

In a written and secret ballot

First Ballot:

Dr. R. W. CAIRNS	56
Sir HAROLD THOMPSON	55
Prof. G. SARTORI	23

Total voting 134, simple majority 68.

Second Ballot:

Sir HAROLD THOMPSON	72
Dr. R. W. CAIRNS	62

Total voting 134, simple majority 68.

Sir HAROLD THOMPSON was declared the elected Vice-President. A proposal from the USA Delegation, approved by Dr. CAIRNS, that Sir HAROLD THOMPSON be declared elected unanimously, was accepted with acclamation by Council.

Secretary General:

In a written and secret ballot

Dr. W. GALLAY	94 in favour
	22 abstentions
	18 invalid

Total voting 112, simple majority 57.

Dr. GALLAY was declared the elected Secretary General.

Treasurer:

In a written and secret ballot

Prof. O. HORN	134
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Total voting 134, simple majority 68.

Prof. HORN was declared the elected Treasurer.

Elected Members to Bureau:

In a written and secret ballot (see Minute 5) for 5 vacancies

Dr. O. ISLER	116
Prof. N. M. EMANUEL	113
Prof. S. SHIBATA	113
Prof. G. SARTORI	106
Prof. E. D. BERGMAN	86
Prof. R. TRUHAUT	76
Dr. P. C. CARMAN	31
Dr. T. A. RAFTER	25

Total voting 670, simple majority 68.

The 5 vacancies were declared to be filled by Dr. ISLER, Prof. EMANUEL, Prof. SHIBATA, Prof. SARTORI, Prof. BERGMAN.

The meeting offered its congratulations to the 5 newly Elected Members to the Bureau.

The following elections of Officers made by the Divisions were approved by Council:

Physical Chemistry Division

President (1969-1973):	Dr. G. WADDINGTON
Vice-President (1971-1975):	Dr. R. N. JONES
Secretary (1971-1975):	Prof. S. SUNNER
[Past-President (1969-1973):	Sir HARRY MELVILLE]

Inorganic Chemistry Division

President (1969-1973):	Prof. O. GLEMSER
Vice-President (1969-1973):	Prof. V. GUTMANN
Secretary (1971-1975):	Prof. L. MALATESTA
[Past-President: vacant due to death of Prof. J. H. DE BOER]	

Organic Chemistry Division

President (1971-1973):	Prof. G. OURISSON
Vice-President (1971-1973):	Prof. A. KJAER
Secretary (1971-1973):	Prof. H. ZOLLINGER
[Past-President (1971-1973):	Prof. D. H. R. BARTON]

Macromolecular Division

President (1971-1975):	Prof. H. BENOIT
Vice-President (1971-1975):	Prof. C. G. OVERBERGER
Secretary (1971-1975):	Prof. G. SMETS
[Past-President (1971-1975):	Prof. O. WICHTERLE]

Analytical Chemistry Division

President (1969-1973):	Prof. W. KEMULA
Vice-President (1971-1973):	Prof. N. TANAKA
Secretary (1967-1975):	Mr. R. W. FENNELL

Applied Chemistry Division

President (1971-1975):	Dr. R. W. CAIRNS
Vice-President (1971-1975):	Dr. H. EGAN
Secretary (1971-1975):	Dr. W. W. MEINKE
[Past-President (1971-1975):	Dr. W. GALLAY]

Minute 23 Dates and Places of XXVIIth Conference and XXIVth Congress

On the recommendation of the Bureau, Council

Resolved:

- (i) that the location of Hamburg and timing of the XXVIIth Conference be carefully reviewed in an effort to reduce the cost to the Union;
- (ii) that the proposal to hold the XXIVth Congress in Hamburg during the period 3rd-8th September 1973 be approved.

Slight changes to the announced section themes for the XXIVth Congress and its Joint Symposia were reported by the German Delegation. The proposed scope of the XXIVth Congress was approved by Council.

Minute 24 Place of XXVIIIth Conference and XXVth Congress

On the recommendation of the Bureau, Council

Resolved:

- (i) that an invitation to hold the XXVth Congress (1975) in Israel be accepted;
- (ii) that the location of the XXVIIIth Conference (1975) should be determined only after a study of relative costs of other venues has been made.

The Council received a letter from Japan, foreshadowing an official invitation to hold the XXVIth Congress in that country in 1977.

Minute 25 Any Other Business

The Brazilian Delegate made a brief statement on severe problems encountered by Associação Brasileira de Química in the past few years. These problems had now been overcome and the

Associação was able to pay the annual subscription to the Union for 1971. However, it requested to be released from making the payments for 1969 and 1970. Dr. REES ruled that the request should be referred through incoming President BÉNARD for consideration by the Bureau.

Votes of Thanks

Dr. REES called on Sir HAROLD THOMPSON to give an appreciation of the work of Dr. MORF as Secretary General over the past 16 years—Council stood in acclamation. On the proposal of the USA Delegation, the acclamation was extended to Prof. BAILAR who had served as Treasurer for 8 years. After thanking the Delegates for their attendance and attention to IUPAC matters, Dr. REES handed over the Presidency to Prof. BÉNARD. The latter paid tribute to the excellent leadership of the Union by Dr. REES over the past 2 years. This was endorsed with acclamation by Council.

ADDRESS OF INCOMING PRESIDENT AT CONCLUSION OF XXVI COUNCIL MEETING

The presidential term in IUPAC is fixed at two years. That is why today we are sorry to see Dr. REES leaving this Chair.

Council Delegates are very well aware of your many contributions to IUPAC during the past biennium. However, I think it is necessary to express officially our recognition of your valued contributions at the conclusion of this Council. And in my capacity as your successor, it is my great pleasure to do so.

I have had the opportunity to work beside you as Vice-President and I have appreciated your very deep knowledge of scientific and technical organizations throughout the world. I have been equally able to appreciate your pragmatism—a quality which is a great help in handling people as well as administration. I am sure it will be necessary for me to ask for the benefit of your wide experience in the next two years when you will still take part in our meetings as Past-President.

Finally, on behalf of all the Delegates to this Council and all the Member Nations of the Union, I thank you very warmly for the work you have done to the great benefit of international cooperation during the period you have been President of IUPAC.

J. BÉNARD

TRIBUTE TO DR. R. MORF

I am very pleased to have the privilege of saying a few words about Dr. MORF.

At the IUPAC meeting in Zürich, 1955, I met Rudolf, whom I had known earlier when he spent some time working at Oxford, coming down the steps of one of the University buildings as I was going up. He told me that he had just been invited to become the Secretary General of the Union and asked me what he should do. Of course I told him that he should accept, and we were all glad that he did.

During the subsequent years, he did an immense amount of work, and developed the organization, mechanism of working, and status of the Union. He was largely responsible for its rapid evolution in those years. Among other things, too, as I have mentioned earlier at this meeting, he started the *Information Bulletin* which has proved so useful, and he brought a force into our affairs which was recognized by all. He has always tried to take account of the interests and to consider the needs of the smaller countries as well as the bigger ones—both the less developed as well as the more developed.

Like many others, I remember the kindness shown to us by Dr. MORF, and his wife, at Kyburg, and at other places. I remember him too, not as Dr. MORF, but as Oberst MORF—Colonel MORF—with his horses.

Sixteen years is a long time to carry the duties and responsibilities of the Secretary General of a Union such as this, and personally I know that I should feel happy to be relinquishing the job after such a long period of office.

In recent years, Rudolf has had some bad luck, through his motor accidents; and his wife, too, has suffered illness. I am sure that we all hope that very soon they will both be restored to full health and happiness.

This is not a farewell, for I feel sure that we shall continue to have the help and interest of Dr. MORF in the future. I ask you to thank him warmly for all his good work and wish him well in the years ahead.

H. W. THOMPSON

TRIBUTE TO PROF. J. C. BAILAR, JR.

The retirement of Prof. BAILAR as Treasurer of IUPAC after eight years' service in this position provides a suitable occasion on which to draw attention to the great contribution that he has made to the Union and to chemistry. Prof. BAILAR was Chairman of the *ad hoc* Finance Committee established in 1961 to make recommendations to the President and Bureau on the Union's finances and their continuing review. It was on this Committee's recommendation that a Standing Finance Committee was established by Council in 1963. It was clear at that time that the Union was about to enter a period of expansion and that this would be associated with a change in the nature of the Union's administration. As Treasurer during this period, Prof. BAILAR has borne a greater than normal burden in attempting to satisfy the demands and needs of the Union's scientific activities and in providing income to meet the cost of a permanent Secretariat. The Company Associates Scheme, which was introduced during his term of Office, has provided a continuous source of support for the IUPAC Secretariat in Oxford. It has been characteristic of Prof. BAILAR's Treasurership that he has given the matters under his responsibility the most detailed and careful attention, and that his policies have led to a number of dramatic changes in some expenditure items. Moreover, as a Member of the Executive Committee, he has paid great attention to all issues before that Committee, not only to those with financial implications. During my Presidency I frequently took advantage of Prof. BAILAR's personal advice on matters on which clear decisions were difficult.

Prof. BAILAR's contribution to the Union is far greater than it appears, and I wish to record, both on behalf of the Union and myself, immense appreciation of all his efforts.

A. L. G. REES

COMMITTEE ON PUBLICATIONS

15 July 1971

Present: Prof. Sir HAROLD THOMPSON (Chairman), Dr. L. C. CROSS, Dr. R. L. KENYON, Prof. B. C. L. WEEDON, Dr. R. MORE, Dr. M. WILLIAMS.

1. Matters Arising from Previous Meeting (30 June 1970)

- (i) *Publications Arising from XXIIIrd IUPAC Congress.* Arrangements were in hand to print by photooffset, within three months, those main lecture manuscripts handed in before the end of the Congress.
- (ii) *Joint Sponsorship of Symposia.* The Bureau had agreed to insert in the Advance Information Questionnaire the phrase 'The publication of proceedings of a symposium cosponsored with another organization shall be the subject of special arrangements'.

2. Revised Version of 'IUPAC—What it is—What it does—How it works—How it is financed'

A draft revision of the earlier pamphlet was presented by Sir HAROLD THOMPSON. Prof. WEEDON suggested amplification of the text where it dealt with an IUPAC Congress and with supplements to *Pure and Applied Chemistry*. Another proposal was to include, as an appendix, the more important publications issued to date by the Union. The revised text would be circulated for approval by the Bureau (Executive Committee).

There seemed to be two possibilities for publication:

- (i) The entire text as a feature article in, say, *Chemistry in Britain* and/or *Chemical & Engineering News*, with IUPAC purchasing bulk reprints.
- (ii) As a pamphlet by IUPAC.

The procedure adopted should ensure that the Union was brought to the attention of younger chemists. Reprints/pamphlets should be available to give away at all IUPAC-sponsored symposia.

3. Information Bulletin: Review of Status

Many of the recommendations from the previous meeting had subsequently been implemented:

- (i) The content had been extended to include reports of meetings of IUPAC bodies held outside of IUPAC Conferences.
- (ii) Technical reports, better suited to the Bulletin than to *Pure and Applied Chemistry*, were being issued as a second series of Appendices (on blue paper).
- (iii) Full production control had been assumed by the Secretariat and a schedule instituted to ensure that three issues were definitely produced per year.
- (iv) Printing had been transferred from Switzerland to UK, with savings in costs. Liaison with the printer was also easier and delays in delivery of bulk copies to the Secretariat had been eliminated.

It now seemed advantageous for the Secretariat to abstract important items from the Bulletin in advance of publication and distribute the information to the most important chemical news journals.

It was agreed to recommend to the Bureau (Executive Committee) that the subscription for 1972 remain at \$2.50 (£1.00) with the option of an airmail subscription at \$5.00 (£2.00).

Production costs would need to be watched carefully, especially with the provision of free Appendices to all subscribers to the Bulletin. The Bureau had recommended that lithographic printing be investigated. It might also be opportune to consider a more modern layout.

4. Pure and Applied Chemistry: Price and Frequency for 1972

Printing costs were expected to rise 7.5% per annum over the next few years. It was agreed to recommend to the Bureau (Executive Committee) that the subscription to the journal in 1972 be increased to \$40.50 (£13.50) per volume. The frequency of publication in 1972 would remain at 4 volumes per annum.

5. Pricing of Reprints from PAC and of Supplements

The Committee thought that, in future, the Union might wish to subsidize occasional reprints from *Pure and Applied Chemistry* or its supplements. These publications should not normally be priced at greater than 25% above the cost of a single issue of the journal.

6. Review of Reprinting/Bulk Purchase of Nomenclature Rules

At the IUPAC Conference in 1969 it was decided that, for a trial period of two years, National Adhering Organizations and appropriate national societies (but not commercial publishers) should be allowed to reprint final IUPAC nomenclature rules in their respective journals and/or purchase reprints after Butterworths had published the final rules. Dr. WILLIAMS reported that there had so far been no request to reprint and very little interest in bulk purchase. It was agreed to recommend to the Bureau (Executive Committee) that the trial arrangements be allowed to continue until decided otherwise. Existing policy that translations may only be authorized by the appropriate National Adhering Organizations was reaffirmed.

7. Dictionary of Chemical Terminology

A suggestion had been received for IUPAC to sponsor a dictionary of chemical terminology. Such a publication would enable editors to restrict the invention of unnecessary new words and misapplication of existing terms. Persons wishing to introduce new words might be obliged to refer the matter to an IUPAC committee. The Committee considered this to be a formidable task for the Union to undertake and of a lesser priority than a number of more urgent projects.

8. Reports on Low Vapour Pressure Standard Materials

The Commission on High Temperatures and Refractories was assisting with a programme of interlaboratory comparisons to establish data on a series of low vapour pressure reference materials. Initially, the work had been co-ordinated solely through US National Bureau of Standards, which had issued reports on the studies of metallic gold, cadmium, and silver. The Inorganic Chemistry Division was expected to propose to Council at the XXVIth IUPAC Conference that these metals be recommended officially by the Union as low vapour pressure standards. Subsequently, the reports could be published in *Pure and Applied Chemistry*.

9. Report to Bureau and Council

A draft report on IUPAC publications, prepared by Sir HAROLD THOMPSON and intended for the Bureau and Council at the XXVIth IUPAC Conference, was considered. Prof. WEEDON asked for two matters to be stressed:

- (i) All issues of *Pure and Applied Chemistry* outstanding from previous years had been cleared and the volumes scheduled for 1971 would be completed before the end of the year. In addition, 4 supplements to the journal had appeared since 1969 and 3 more were currently being processed. This tremendous effort—the equivalent of 8 volumes of the journal would be published in 1971—had ensured that the Union's publishing programme was fully up to date and future material could be handled expeditiously.
- (ii) The policy of appointing a Symposium Editor to deal with the papers to be published from a IUPAC-sponsored meeting was beginning to show real benefits.

10. Membership

Sir HAROLD THOMPSON proposed a slight modification in wording for the terms of reference of the Committee on Publications:

'To advise the Bureau (Executive Committee) on all matters of publication, including policy'

He felt that, because the Committee had only been created in 1969, there was no need yet to define a period of service for Members.

11. Publicity for New IUPAC Nomenclature Recommendations

Following an initiative by President REES, it had been agreed to produce a publicity leaflet covering the new final (definitive) nomenclature recommendations of the Union. Costs were to be shared jointly with Butterworths. The format for the leaflet had recently been approved and Butterworths' proposals for using it in a mail campaign were submitted to the meeting. In view of the present financial difficulties of IUPAC, the Committee felt that Dr. REES's wish to draw attention to the new nomenclature recommendations might be fulfilled by a short article in *Chemistry in Britain* and/or *Chemical & Engineering News*. Butterworths should feel free to undertake a limited mailing of the leaflet on its own behalf.

12. Report from Assistant Secretary re. Audiotape for Symposia

This report had been referred by the Bureau for consideration by the Committee on Publications. Prof. WEEDON thought that the proposed use of audiotape was unsuitable for plenary lectures (generally reviews), although well suited to contributed papers (original research) which were not usually published by IUPAC. Dr. KENYON indicated that ACS had carried out some trials with audiotape at meetings and these would be reported next year. He believed that some lecturer resistance to audiotape would be encountered. Further consideration of the subject was deferred, pending an evaluation of the photooffset printing of papers from the XXIIIrd IUPAC Congress.

13. Future IUPAC Publishing Policy

It was agreed to hold a meeting of the Committee in London during 1972 with this subject as the main item for discussion. Papers expressing the views

of Drs. CROSS, GRÜNEWALD, and KENYON should be invited for precirculation. The Assistant Scientific Editor, Prof. CULLIS, should be asked to participate. Dr. CROSS offered the offices of the Chemical Society (London) to accommodate the meeting.

14. Any Other Business

- (i) *Enzyme Nomenclature*. A new report on Enzyme Nomenclature would be available shortly from the IUPAC-IUB Commission on Biochemical Nomenclature. Sir HAROLD THOMPSON suggested that, subject to the agreement of IUB, the report be offered for publication by Butterworths under the joint imprint and copyright of the two Unions. The royalty (10%) should be shared equally between them.
- (ii) *Directory of World Research Laboratories in Fermentation*. The Fermentation Industries Section had proposed the preparation of a directory of research laboratories throughout the world engaged in studies on fermentation. It was envisaged that a publisher would undertake most of the burden of assembling the significant material, with the assistance of Section Members as advisors and consultants. The Committee was of the opinion that such a directory was not suitable for inclusion in the official IUPAC publishing programme.
- (iii) *Waiving of IUPAC Rights of Publication*. Contrary to some opinions, the waiving of publication rights for symposia receiving IUPAC sponsorship had been generous:

1969	12%
1970	19%
1971	28%
1972 (to date)	38%

The situation should be watched carefully to protect IUPAC and its publisher: some important material was being allowed publication outside the Union.

COMMITTEE ON TEACHING OF CHEMISTRY

19 and 20 July 1971

Present: Prof. R. W. PARRY (Chairman), Mr. D. G. CHISMAN (Secretary), Prof. J. A. CAMPBELL, Prof. Sir RONALD NYHOLM, Prof. M. OKI, Prof. C. N. R. RAO, Prof. G. M. SCHWAB, Dr. P. SYKES.

1. Chairman's Welcome

Prof. PARRY welcomed the Members and particularly Prof. RAO from India, to his first meeting.

2. Finalization of Agenda

It was agreed to discuss the composition and constitution of the Committee before the other items since the Committee would be welcoming as Observers, a number of National Representatives and other chemists interested in chemical education later during the meeting.

3. Composition and Constitution

Draft Standing Orders for the Committee were considered and after minor amendments, agreed. These Standing Orders would be submitted to the Executive Committee of IUPAC for approval.

The Committee agreed that the implementation of the Standing Orders concerning the retirement of two Members of the Committee in 1971/72 and the appointment of two new Members should be considered by the Chairman and Secretary, who would submit names to the Executive Committee for consideration. It was also agreed that one of the new Members of the Committee should be an industrial chemist with interest in chemical education. Such a person should not necessarily be a research director, but rather a chemist who had a broad knowledge of the chemical industry and an appreciation of the problems of industrial training. A number of names were suggested by the Committee and these together with others that might be submitted later, would be sent to the Executive Committee for consideration.

4. Minutes of Previous Meeting (20 July 1970)

The minutes of the meeting held in Colorado were approved, after correction to Minute 29 concerning the price of the Frascati Conference Report.

5. Matters Arising from Colorado Meeting

(a) *International Conferences and Symposia.* It was noted that the International Meeting to be held in Brazil from 30 August to 3 September 1971 would be taking place as arranged and it was hoped that the Chairman, Prof. PARRY, would be able to represent IUPAC. It was reported that the proposed meeting in 1972 in Yugoslavia would not now take place.

(b) *Federation of European Chemical Societies.* It was reported that this new Federation was applying to IUPAC for Associated Organization status, but that otherwise there was nothing further to report as far as chemical education was concerned.

(c) *Report on Work of Committee.* The Committee received the printed report of its work during the last two years, which would be presented to the Council of IUPAC by the Chairman.

6. Committee Publications

- (a) *Evaluation in Chemistry*. The Secretariat had provided a note of the present position with respect to sales of the Report of the Ceylon Workshop (1968), entitled *Evaluation in Chemistry*. There were still about 200 copies in stock and it was agreed that these should be distributed without delay, if necessary free-of-charge. A number of suggestions and requests for further copies were received from Members of the Committee and Observers. These, together with any further suggestions, would be submitted to the Secretariat for consideration.
- (b) *Frascati Conference Report*. The present position with respect to the printing and distribution of the Conference Report of the Frascati Meeting was noted. It was agreed that for a relatively small print order of a book produced as a hard back in letter press, the selling price would inevitably be high. The Committee believed, however, that the needs in chemical education were for quick and relatively cheap methods of publication with wide dissemination. These views would be submitted to the Executive Committee.

It was suggested that a list of publications sponsored by the Committee or produced in conjunction with it should be made available and sent to all National Representatives as well as to UNESCO. Through the National Representatives, it might be possible to produce a list of organizations within the individual countries, interested in receiving publications on international aspects of chemical education.

7. UNESCO Matters of Concern

- (a) *University Survey*. The Committee received a first draft of a publication entitled *University Survey of Chemical Education*, which had been prepared by Prof. A. K. HOLLIDAY and Dr. R. MASKILL (University of Liverpool), as part of the contract between the Committee and UNESCO for 1970. This Survey was based on articles submitted from 22 authors in different countries who had been commissioned to write short papers on trends in chemical education within their respective countries.

The editors had written a general introductory section based on the 22 articles, indicating the present position with respect to chemical education at university level and trends likely to affect future developments in various countries. It was proposed that this introductory section should be followed by 22 appendices, containing the edited articles submitted originally by the individual authors.

The Committee considered that the first draft was well-written and reflected the trends in chemical education throughout the world. A number of proposals for improvements were received and these would be conveyed to the editors. It was suggested that copies of the edited draft together with the relevant appendix should be sent to the authors and to National Representatives, so that further improvements might be made. Also, under the contract with UNESCO, it would be necessary to send a complete set of the material to the UNESCO Division of Science Teaching for comment.

The Committee agreed that this publication should go ahead and that copies should be printed and made available by January 1972, if possible. In the meantime, the Committee's thanks would be conveyed to the editors for the considerable work which they had already devoted to this publication.

- (b) *Chemistry Guide Book*. The Secretary reported difficulties over publication of the UNESCO *Chemistry Guide Book* for which the Committee had received a contract from UNESCO some years ago. It was intended to be one of a series of curriculum guide books. Two drafts of the publication had been submitted to UNESCO, under the editorship of Mr. B. STOKES, but unfortunately these drafts were still considered deficient by the UNESCO Advisers. It was understood, however, that Penguins (publisher of the series) was reasonably satisfied with the draft and concerned that the series should not be deficient in having no book on chemistry. Unfortunately, with the lapse of time, it was possible that the UNESCO Contract had now expired and it might be difficult to revive the project under UNESCO auspices.

The Committee agreed that further opinions would be desirable on the suitability of the material for a guide book in the above series. It was decided to send copies of the complete manuscript to some Members of the Committee for comment and advice. If possible, copies of the parallel guide books on physics and/or mathematics already published in the same series should also be sent to these Committee Members.

- (c) *Chemistry Advisory Meeting*. A report of the Chemistry Advisory Meeting called by UNESCO (Paris, May 1971) was available and also subsequent correspondence with Dr. H. FOECKE of its Division of Science Teaching. Although it was considered unfortunate that it had been impossible to combine that meeting with the present IUPAC Committee on Teaching of Chemistry meeting, it was nevertheless desirable from both UNESCO and IUPAC's point of view that close collaboration between the two organizations in the field of chemical education should be maintained. Indeed, it was observed that, if firm proposals from the IUPAC Committee on Teaching of Chemistry could be submitted to UNESCO in the near future, these could well be included in UNESCO's programme for the next biennium. In particular, the possibility of collaborating with UNESCO in arranging a major international conference on chemical education every four years, beginning hopefully in 1973, would be explored. Such major reviews of areas of science education would, in the future, provide material for special editions of the UNESCO series of *New Trends*. Other proposals would be considered at the meeting with National Representatives, then the Officers of the Committee would formulate firm proposals for submission to the UNESCO Division of Science Teaching.

- (d) *Meetings in 1971/72 under UNESCO Auspices*. The Secretary reported that UNESCO was proposing to arrange a meeting in South East Asia to evaluate the UNESCO Chemistry Pilot Project in Asia, which was launched in 1965. The evaluation would be undertaken by the participants from the various Asian countries which had been involved in the Project and would be coordinated by Dr. C. WATTON, one of the former directors of the Project. The Committee expressed considerable interest in this evaluation and wished to be kept informed, particularly if it gave rise to a collection of reports and papers comprising the most significant materials produced by the Project over the five years.

The Secretary also reported on plans for a conference on chemical education to be held in Nairobi (Kenya) under UNESCO auspices. This conference would be mainly for chemists from African Universities, but it was noted that there would be a number of outside speakers.

8. ICSU Committee on Science Teaching

The Committee received, for information, a report of the meeting of the ICSU Committee on Science Teaching, held in Paris in May 1971. Special attention was drawn to the section concerning the place of integrated science in the educational system and the opinions of the individual teaching committees on the stage in the educational system at which they considered it desirable, or essential, to separate science into its separate subjects; and at which point should they, or could they be coordinated or integrated in some crossdisciplinary or interdisciplinary way. It was generally agreed that the presentation of science in an integrated form depended very largely on the capabilities of the individual teacher, and even at the elementary or junior high school level, such integration, although desirable, would be dependent on the skill and ability of the teacher. At the higher level, true integration might be difficult to achieve, but one approach might be to set problems in chemistry which were based on biology or physics. Some examples of such problems were submitted by Prof. CAMPBELL. At all levels, the problem of integration was mainly a matter of transfer of knowledge, but it was agreed that the science subjects should never be so separate that they could not be interrelated.

These views would be submitted to the ICSU Committee on Science Teaching.

9. Meeting with National Representatives

Arrangements for the meeting with National Representatives on 22 and 23 July were discussed and a timetable for the various items agreed.

10. Applied Chemistry

- (a) *Proposal for Study of Chemical Technology Developments in Latin America.* A proposal submitted by Mr. W. SABLE (Oxford Polytechnic) for a major project in chemical technology development in Latin America was received and discussed. The Committee agreed that this was an interesting proposal and worthy of further exploration. They considered, however, that before the Committee could endorse the proposal there would have to be evidence from the countries concerned that this type of survey of chemical industrial development was really required. The Committee also agreed that the involvement of UNESCO Regional Office in Montevideo was most desirable. This particular Office was already considerably involved in studies of manpower and industrial development within Latin America and it was organizing a conference in Venezuela in 1972, to which representatives of Ministries of Science and Education from Latin American countries would be invited in order to study the type of problem outlined in the proposal of Mr. SABLE.

It was agreed to await further comments from Mr. SABLE following his visit to Mexico and Venezuela in 1971 and to await requests from individual Latin American countries for assistance in this type of project appraisal. In any event, it was clear that no financial assistance could be forthcoming from IUPAC itself.

- (b) *Austrian Chemical Society.* A proposal from the Austrian Chemical Society that activities in applied chemistry should be considered by the IUPAC Committee on Teaching of Chemistry was received. In particular, it was suggested that the provision of postgraduate refresher courses for practising chemists should be made more generally available and that

the IUPAC Committee should support these ideas. The Committee agreed that these suggestions were important but it believed that considerable work in this direction was already taking place in various countries: this subject should be reviewed in more detail at the meeting with National Representatives.

11. Future Activities

It was agreed to defer consideration of this item until the meeting with National Representatives. Thereafter, the Chairman and Secretary would draft proposals for consideration by UNESCO and the IUPAC Executive Committee.

12. Teaching of Clinical Chemistry

The Chairman welcomed Prof. RUBIN and Prof. LOUS, Chairman and Secretary, respectively, of the Commission on Teaching of the Clinical Chemistry Section. Prof. RUBIN outlined the role of clinical chemistry and its position in relation to medicine and pure chemistry. He also outlined the activities of his Commission and referred particularly to a survey of the status of teaching of clinical chemistry which was currently being carried out. This survey, which would cover the 28 National Organizations linked with the International Federation of Clinical Chemistry, would deal with the history of the subject, legal status, education and training of staff (both medical and nonmedical), place of clinical chemistry in hospital and nonhospital services, place of clinical chemistry in medical and nonmedical education, possible developments in the next ten years, national societies and journals concerned with clinical chemistry, status and training of technicians and laboratory workers in clinical chemistry, as well as a biographical section.

Reference was made to collaboration between the Commission on Teaching in Clinical Chemistry and the World Health Organization and through WHO, the assistance the Committee might give to developing nations.

It was agreed that closer collaboration should be established between the Commission on Teaching of Clinical Chemistry and the main IUPAC Committee on Teaching of Chemistry: ways and means of bringing this about were discussed. Reports of meetings of the respective bodies should be exchanged as well as commissioned reports and surveys. The possibility of collaboration through both WHO and UNESCO was also mentioned.

13. Date and Place of Next Meeting

It was agreed that the next meeting of the Committee should be held at Easter 1972, probably in Paris. This would allow the Committee to consult with the UNESCO Division of Science Teaching in the preparation for a major international conference on chemical education in 1973, to which National Representatives and other leading chemical educators would be invited. It was hoped that the major meeting would receive some support from UNESCO.

14. Other Business

- (a) Reference was made to the publication of a new educational journal *Unichimie*.
- (b) It was agreed that Prof. J. A. CAMPBELL should attend a meeting of the Interdivisional Committee on Nomenclature and Symbols as an Observer from the Committee on Teaching of Chemistry.

Meeting of Committee on Teaching of Chemistry with its National Representatives

22 and 23 July 1971

1. Introduction

This first meeting between the IUPAC Committee on Teaching of Chemistry and its National Representatives was attended by 16 National Representatives or their substitutes, together with Observers from UNESCO, the American Chemical Society (ACS) and the US National Science Foundation, as well as Members of the IUPAC Committee on Teaching of Chemistry. The following countries were represented: Argentina, Australia, Colombia, Germany, India, Italy, Japan, Netherlands, New Zealand, Poland, Republic of South Africa, Sweden, Switzerland, UK, USA, Yugoslavia.

The meeting was opened by a welcome given by Dr. B. RIEGEL, Chairman of the US National Committee for IUPAC. Sir RONALD NYHOLM, the first Chairman of the IUPAC Committee on Teaching of Chemistry, outlined the role of National Representatives and emphasized the wish of the IUPAC Committee to extend its contacts with chemical education to more countries. It was hoped that all 43 member countries of IUPAC would, in due course, appoint a National Representative to the IUPAC Committee on Teaching of Chemistry. The present Chairman of the IUPAC Committee, Prof. PARRY, also welcomed the National Representatives and expressed pleasure that so many had been able to attend without direct financial assistance from IUPAC.

2. IUPAC as an Agency for Promoting International Cooperation in Chemical Education

- (a) *Proposal for Creation of a Panel of International Consultants.* Prof. CAMPBELL introduced a discussion on the desirability of establishing a panel of international consultants to whom countries could turn, if they so wished, for advice on various aspects of chemical education. He referred particularly to the importance of examinations in determining curricula in chemical education and suggested that a procedure for referring and commenting on examination questions by international experts, could produce a change in the methods of teaching chemistry. The suggested procedure would be for a country with a national examination system, if it so wished, to send examination questions to a reviewer who would then comment and return the questions. Those who had set the questions could then see the opinions of experts from outside the country concerned.

In the ensuing discussion, most of the National Representatives commented and the following summarizes the principal points raised. The names of the international panel should be known and anonymity should not be preserved. In this way, a personal relationship might be built up between members of the international panel and particular countries. The request for comment on examination questions must originate from the country concerned and it was essential that those undertaking the review should be familiar with that country. Even so, there was a danger of the seniority syndrome being established with the implication of universal authority vested in a panel of experts and with the added implication of a creditation to particular examination systems. Furthermore, the language in which the examination questions were written could be a problem, particularly with certain Asian languages.

On balance, the meeting felt that to restrict such an international review to the subject of examination questions would not be in the best interest of chemical education generally. Instead, many considered that any review by an international panel could include the curricula and syllabuses as well as the examination system itself. The reviewers should work within the framework of material actually being taught, rather than necessarily by a printed syllabus. One National Representative considered that the international panel should deal with the whole range of development and evolution of educational structure, particularly at university level, but many felt that this was encroaching on the politics of university administration and would not be specific enough for chemical education.

The possibility of producing guidelines for preparing examination questions was discussed and the desirability of making available banks of examination questions at various levels and even model answers was mentioned.

The possibility of using international consultants to assist countries with other aspects of chemical education, such as local generation of equipment and supplies in developing countries, was also discussed. Particular reference was made to the importance of making known the availability of sophisticated services, such as photoelectron spectroscopy, NMR, and Mössbauer spectroscopy. The possibility of twinning arrangements between institutions in a developed country and a developing country was mentioned as a means of fostering chemical research and for encouraging an exchange of research scientists.

- (b) *International Book Exchange*. Dr. SYKES introduced a discussion on the wider availability of chemistry books. This would apply particularly at the university level, rather than the school level. In order to ascertain the present position with respect to the availability of nondomestic books in various countries, he invited the National Representatives to complete and return a questionnaire on this subject to him by 1st October 1971. Those who were not able to be present at the meeting would receive a questionnaire separately by post. He undertook to analyse the comments and to make recommendations to the IUPAC Committee on Teaching of Chemistry.
- (c) *Short Courses and Inservice Training for Practising Chemists*. Dr. M. PASSER (ACS) outlined the history of development of the ACS Short Courses. He referred to the availability now of ACS Courses on film as well as audio courses and audio lectures and the fact that ACS was looking into the possibilities of video cassette as a means of presenting short courses for practising chemists. Reference was made to the availability of the ACS Short Courses in India this year as a recommendation following the binational conference on chemical education held in India in 1969.

Developments in other countries were reported and reference was made to the availability in UK of a catalogue listing short courses being offered in that country during the present session. In Australia, a survey of continuing education facilities had already been undertaken and the recommendations of a report on this subject were being followed up. In other countries, National Chemical Societies were actively involved in arranging inservice courses for practising chemists and the general view of the meeting was that information on such developments should be exchanged as frequently as possible.

- (d) *International Exchange of Films and Information on New Educational Materials*. Mr. R. L. SILBER (ACS) introduced a discussion on the availability of chemistry films in various countries. Reference was made to the activities of the UNESCO films section and to the availability of an international film library, dealing with scientific and technical films housed in OECD. This organization would, however, only be available to member countries of OECD. Reference was also made to the International Scientific Films Association which had been suffering from financial difficulties, but which was likely to be revived in the near future with some support from UNESCO.

The possibility of establishing an international film exchange centre for receipt and distribution of chemistry films was mentioned, but it was realised that this would require substantial financial support, if it was to be a success. If such a centre was established, then two copies of every new chemistry film should be sent to the centre, one for the library within the centre and the other copy for distribution to various countries. The difficulties of sending films overseas were mentioned and also the problem of language and the need for translation of sound tracks.

With regard to other educational materials, reference was made to 8-mm film loops, overhead transparencies, and other new educational technologies of relevance to chemistry teaching. The problem in many developing countries of storage of film materials, including film projectors, in airconditioned surroundings, was a very real one, as also was the problem which applied to all countries, of the different types of hardware and consequent difficulty of interchange of materials. For instance, reference was made to the standard and super 8-mm film loops and film loop projectors.

It was generally agreed that more information on educational aids to chemistry teaching would be desirable and that such information should be provided, perhaps through an informational booklet. It was not regarded as sufficient just to quote the titles of films or film loops, but rather to give some indication of content and suitability for various audiences.

3. Chemical Nomenclature in Chemical Education

Representatives from IUPAC Commissions on Nomenclature, Symbols, and Atomic Weights, were present for a discussion on chemical nomenclature in teaching of chemistry, which was introduced by Prof. CAMPBELL.

It was pointed out by Prof. MCGLASHAN, Chairman of the IUPAC Commission on Physicochemical Symbols, Terminology, and Units that this Union was not the world authority on units. Nevertheless, IUPAC followed the *Système Internationale* (SI) and recommended appropriate quantities, units, symbols, and nomenclature for use by chemists.

Reference was made to a recently published booklet by the Association for Science Education in UK, *Nomenclature, Symbols, and Terminology for Use in School Science*, with the publication of which, Members of IUPAC Nomenclature Commissions had been involved. It was generally agreed, however, that this publication would not be suitable for general recommendation by IUPAC for adoption in other countries for school use in nomenclature and symbols. Instead, it was proposed that IUPAC should produce a separate simplified version of its nomenclature and also a separate simplified version of its atomic weight values with suitable footnotes, for use in chemical education, particularly at the high school level. Such simplified versions would be particularly recommended to the editorial staff of publishers of

school chemistry textbooks, as well as to science teaching associations and through them, to potential authors among school and college staff.

It was agreed that the IUPAC Committee on Teaching of Chemistry should set up the organizational structure to enable such simplified booklets to be produced, but that the actual work of compilation of the booklets, should be in the hands of representatives from the various IUPAC Nomenclature Commissions and also school teacher representatives.

4. Chemistry for the Concerned Citizen

Prof. W. B. COOK (USA National Representative) presented a paper entitled *Chemistry—An Approach to Understanding Science in Society*, and referred specifically to the section of a conference held in Snowmass, Colorado, in July 1970 (sponsored by the ACS Division of Chemical Education), dealing with chemistry for the citizen. He mentioned that as a direct followup of the conference, there had been a national conference in USA on the public understanding of chemistry (December 1970, Colorado State University). Arising out of these two conferences, there were firm recommendations for new programmes in chemistry at high school level, directed at improving the public image of chemistry and introducing chemistry as a topic of social concern within the curriculum. The full text of Prof. COOK's paper would be published in *Information Bulletin* No. 41 (November 1971), as also would two other papers presented under this item, by Prof. C. N. R. RAO, entitled *Chemistry for the Concerned Citizen—The Case of India*, and by Mr. D. G. CHISMAN and Prof. R. S. NYHOLM entitled *Chemistry for the Concerned Citizen—in UK and British Commonwealth*.

These three papers were well received and in the ensuing discussion, reference was made to activities in other countries to improve the presentation of chemistry as part of general education and to present chemistry to the adult citizen through the medium of the press, television, and radio. The UNESCO Representatives referred to the section within UNESCO dealing with the promotion of public understanding of science and technology and in the publication entitled *International Review* as well as the Committee dealing with out-of-school activities. It was agreed that the three papers presented for discussion might also be published in the *UNESCO International Review*, and possibly elsewhere in national chemical education journals. It was also suggested that the IUPAC Committee might undertake a study to ascertain the nature of curriculum projects throughout the world, concerned with science or chemistry for the citizen. Other suggestions contained in the paper by Prof. RAO (such as the publication of a newsletter on chemical education) were well received and would be referred to again in the conclusions to the meeting.

5. (a) *Inservice and Preservice Education of Chemistry Teachers*. Mr. CHISMAN introduced a discussion on this subject as a result of the replies to questionnaires which the IUPAC Committee had issued, following its previous meeting in mid-1970. He reminded the meeting of the interest that the IUPAC Committee on Teaching of Chemistry had held in this subject for many years and referred, in particular, to the preliminary report published in *Information Bulletin* No. 31 (March 1968), in which there was a firm recommendation: inservice refresher courses for chemistry teachers should be held frequently, so that all chemistry teachers at secondary or high school level should be able to attend one such course at least every five years, and that the courses should be of at least six weeks' duration.

As a followup of this preliminary report, the Committee had decided to try to obtain further factual information on the present position with respect to preservice as well as inservice training of chemistry teachers. It had sent a questionnaire to National Representatives in September 1970. The replies from 17 countries, summarized in tabular form for the meeting, were available for comment. In addition, a considerable amount of supplementary material had been submitted by some National Representatives and this was available also to the meeting.

It was agreed that this information should be circulated to all National Representatives and to UNESCO, but it was suggested that the summary table should be revised and possibly augmented by inviting National Representatives to provide answers to one or two additional questions, such as the proportion of men and women involved in chemistry re-training courses and the relation between subject content and pedagogical aspects in the various preservice and inservice courses.

It was also agreed that this was of sufficient importance for the IUPAC Committee and the National Representatives to continue to monitor developments and to report on them through the medium of newsletters or UNESCO publications from time to time.

- (b) *Enrolments in Chemistry and Problem of Educated Unemployed.* Mr. R. HENZE (ACS) introduced a discussion on the problems of supply and demand of chemists, particularly with reference to the situation currently developing in USA. Prof. PARRY reminded the meeting that a few years ago, the IUPAC Committee on Teaching of Chemistry had been concerned at the trend in many countries away from science. It had, therefore, commissioned Mr. M. BERRY to review the situation and to report on the enrolments of chemistry students at university level in various countries. This report had shown that there was indeed a serious trend away from science, as reflected in the proportions of students wishing to study science in university courses. Nevertheless, in the ensuing years since the report was prepared, the situation in some countries had changed drastically as a reflection of the economic situation, to the extent that there was now a serious unemployment of Ph.D. chemists who wished to take up chemistry as a career. It was this problem that Mr. HENZE pinpointed in introducing a discussion on this topic. Dr. G. HIEBERT of the US National Science Foundation submitted some information on the position as far as unemployment of chemists in other countries was concerned and indicated that in at least a number of Asian countries there was likewise a serious unemployment of scientists. (It was difficult to obtain information that related particularly to chemists in this connexion.)

During the discussion it was suggested by some speakers that chemistry should be regarded as a general education which would enable the successful student to embark on a variety of careers and not just on a career in the practice or application of chemistry itself.

Others referred to the high cost of chemistry courses and the need to specialize so that the chemist who was trained in this way would normally expect to use his training in the pursuit of a career in chemistry. In USA, a survey by ACS of 1,400 universities gave a measure of the supply of potential chemists in the pipeline which could be projected forward to the next six or even nine years. This, on present economic studies, indicated a surplus of chemists who could expect to obtain a career in chemistry, but it was pointed out that the methods of estimating the

demand for chemists were not as accurate as the methods of predicting the supply once the students had got into the pipeline. Mr. HENZE suggested that the meeting, perhaps with UNESCO's support, should try to establish throughout the world a guide to the different types of model used in various countries to estimate supply and demand of scientists.

- (c) *Development of Programmes in High School Chemistry.* Dr. M. GARDNER (University of Maryland) had prepared some information for the meeting on the various curriculum projects in chemistry at the secondary school level, which were being developed in different countries of the world. This information was based largely on the report of the International Clearinghouse on Science and Mathematics Curricula, published biennially by the Science Teaching Center of the University of Maryland. Participants in the meeting were given a copy of this international report and were invited to assist in the compilation of the next edition by urging those in their respective countries concerned with curriculum projects, to send information on their projects to Maryland for collation. It was considered that National Representatives would have a definite contribution to make in this connexion, and it was agreed that when questionnaires were issued to different curriculum groups, for future editions of the Clearinghouse Report, the National Representatives should be informed and urged to assist in following up where necessary.

6. Conclusions

Mr. SILBER summarized the need for correlation of international activities in the field of chemical education and suggested guidelines by which the IUPAC Committee on Teaching of Chemistry could act as the coordinator of activities both nationally and internationally, through the establishment of effective liaison with the national chemical societies, government agencies, UNESCO and other intergovernment agencies, as well as with foundations and nongovernmental organizations, concerned with international developments in chemical education. The desirability of exchange of information through international meetings, say, every four years, was generally agreed, and it was concluded that this should be put to UNESCO as a firm recommendation for action.

Prof. PARRY summarized the principal conclusions that had been agreed during the discussions, referring particularly to (a) the establishment of a consultancy service, (b) the establishment of an international, educational materials exchange and communications network to deal with book and film exchange as well as to launch a newsletter as a means of disseminating information.

It was agreed that these conclusions should be the basis of a proposal to UNESCO for financial support and that this proposal would be formulated and sent to UNESCO as soon as possible, so that it might be considered in time for inclusion in the biennium 1973/74. The actual proposals would be formulated in a document to be available separately.

COORDINATING COMMITTEE FOR ANALYTICAL METHODS FOR CEE AND IARC

17 July 1971

Present: Prof. R. TRUHAUT (Chairman), Dr. H. EGAN, Prof. W. KEMULA, Dr. R. MORE, and Prof. R. PELLERIN. Dr. M. KAPEL attended for Prof. R. BELCHER.

Apologies were received from Prof. BELCHER and Dr. BOGOVSKI of IARC.

1. Prof. TRUHAUT welcomed the Members and announced the resignations of Lord TODD and Prof. P. W. WEST as Members of the Committee.

2. Prof. TRUHAUT described current arrangements between the Food Section of the Applied Chemistry Division and the Analytical Reactions and Reagents Commission of the Analytical Chemistry Division of IUPAC for progressing the 1971 IUPAC-CEE contract. A Liaison Sub-Committee had met in Paris under his chairmanship on 4 February 1971. Prof. PELLERIN reported that methods previously submitted to CEE in 1968, 1969, and 1970 had been critically reviewed by IUPAC. There were now available for the 1971 contract:

- (a) 17 methods held over from 1970
- (b) 23 earlier methods (subject to simple correction and editing)
- (c) 11 earlier methods (subject to editing)

In addition, 17 earlier methods would be set aside for possible later revision and 5 earlier methods for active later revision: the latter included general methods for traces of copper, lead, and mercury which in any case were already being reviewed by the Food Section.

3. It was agreed that whilst more than 20 methods should be submitted from those available for the 1971 contract, a number should be kept in reserve for subsequent contracts.

4. Arrangements had been made for editorial amendments for the 1971 contract: these would be reviewed at a meeting in Paris on 8 September 1971 by Dr. KAPEL and Prof. PELLERIN, together with Dr. COLLINGS and another nominee of the Food Section (possibly Dr. DELMER).

5. Basic arrangements for a 1972 and future IUPAC-CEE contracts would be reviewed at a meeting with the Scientific Commission of CEE in Brussels on 4 November 1971. Prof. BELCHER, Dr. EGAN, Prof. PELLERIN, and Prof. TRUHAUT would attend for IUPAC. Prof. TRUHAUT informed the Members of the Committee about the existence of a preliminary working document prepared by Miss DEMINE, Scientific Advisor to CEE, which he had already critically examined and discussed with her on several occasions. He also indicated that he was told by Dr. GAERNER, Secretary of the CEE Scientific Commission, that the draft for the 1972 contract would be submitted to him soon for comment before finalization.

6. Prof. KEMULA raised the question of the possible participation of the IUPAC International Office for Analytical Chemistry (IOACH) if this project was approved by the Bureau. Dr. KAPEL asked about publication of IUPAC-CEE methods: IUPAC would be free to seek authority to publish its own compendium of methods once they had been published in the official journal of CEE.

7. Dr. MORF emphasized the need for the preparation and circulation in advance of the meeting in November of a clear working document: Prof. TRUHAUT and Prof. PELLERIN undertook to produce one. It was also agreed that each method should be given a clear and separate identity in order to facilitate any subsequent revision procedure.

8. Prof. TRUHAUT also described briefly IUPAC action in cooperative work with IARC for determination of chemical carcinogens in food or in air. The Food Section and the Section on Toxicology and Industrial Hygiene were already engaged in this cooperative programme.

9. The future Membership of the Coordinating Committee was reviewed. The following were proposed:-

Chairman: Prof. R. TRUHAUT

Secretary General of IUPAC (ex officio)

The President/Chairman of the following IUPAC bodies:

Analytical Chemistry Division

Analytical Reactions and Reagents Commission

Applied Chemistry Division

Food Section

Food Additives and Contaminants Commission

Pesticides Section

Toxicology and Industrial Hygiene Section

FINANCE COMMITTEE

18 July 1971

Present: Dr. J. W. BARRETT (Chairman), Dr. E. M. BEAVERS, Mr. J. BROCAT, Dr. C. O. GABRIELSON, Prof. O. HORN, Dr. R. MORF. The President, Vice-President, Treasurer, and Executive Secretary of the Union were in attendance.

1. Terms of Reference, Composition, and Terms of Office

The proposed Terms of Reference, Composition, and Terms of Office for the Finance Committee, as modified at the LXIXth Executive Committee meeting, were accepted (see p. 373).

2. Codification of Accounts

The Union's accounts at Schweizerische Bankgesellschaft must be computerized to come into line with all other operations at the Bank. To facilitate this change a tentative proposal for a new classification of the IUPAC accounts was tabled. It was based on the various items in the current annual budget of the Union. The Claim Form (travel and subsistence) would need to be revised in terms of the proposed codes. It was recommended that the Treasurer and the Secretariat be responsible for the completeness and appropriateness of the proposed codes.

3. Budget Estimates for 1972 and 1973

Preliminary estimates had been prepared by the Secretariat and some modifications introduced by the Treasurer. However, Prof. BAILAR had not been able to eliminate a budgeted excess of expenditure over income for either 1972 (about 10% of income) or 1973 (about 20% of income).

The Finance Committee was unable to recommend acceptance of the budget estimates on the stated expenditure basis. As a general policy, in a nonConference year efforts should be directed towards achieving a sufficient balance of income over expenditure to counteract the inevitable reverse situation in a Conference year.

The following specific recommendation was made by the Finance Committee for consideration by the Executive Committee:

The 1972 Budget Estimates be amended to yield a surplus of \$20,000 and the 1973 Estimates a deficit of not more than \$20,000

and the following suggestions offered as some of the means to bring this about:

- (i) The Division Contingency Funds be reduced in amount.
- (ii) Ways of eliminating projects and/or postponing action on projects be investigated.
- (iii) Consideration be given to limiting the number of Members eligible for expenses in IUPAC bodies below the statutory level.
- (iv) Particular attention be paid in the next two-three years to choice of minimum-cost locations for meetings of all IUPAC bodies.
- (v) The location of Hamburg and timing of the XXVIIth IUPAC Conference be carefully reviewed in an effort to reduce the cost to the Union.

4. Membership of Committee

(i) *Retirements.* On the basis of the new Standing Orders and having completed periods of service of eight years, Dr. GABRIELSON and Prof. HORN retired from the Finance Committee.

(ii) *Nomination of New Members.* The Finance Committee agreed to propose to the President of the Union (Executive Committee) that Prof. A. BJÖRKMAN (Denmark) and Dr. K. HOSHINO (Japan) should fill the two vacancies existing in 1971.

5. Review of Company Associates Scheme

A breakdown of Membership of the Company Associates Scheme was supplied by the Executive Secretary. As of 18 June 1971, there was a total of 216 units from 12 countries, contributing a sum of \$52,500.

The Statement of Responsibilities and Authorizations for the Executive Secretary required that he be responsible for promotion of the Company Associates Scheme. In recent months Dr. WILLIAMS had been in correspondence about the Scheme with some twenty National Adhering Organizations. Only two of these approaches had so far led to new Members. Following the recommendation of Prof. BAILAR, the Finance Committee called on the incoming President, Prof. BÉNARD, to follow up the formal approaches of the Secretariat by writing personally to a prominent industrial chemist in each country to solicit Company Associates.

The Bureau had resolved that, starting in 1972, Company Associates must pay one half of the subscription cost to *Pure and Applied Chemistry*. Concern had recently been expressed on how this requirement was to be brought to their attention. A draft memorandum on the matter, which might be circulated to Company Associates, had been prepared by the Executive Secretary. Changes in wording proposed by Prof. BAILAR were accepted by the Finance Committee, which itself recommended some further amendments.

6. Soliciting Funds for Symposia

After discussing the implications on the Company Associates Scheme of two recent occurrences, the Finance Committee would recommend to the Executive Committee that symposia organizers should not solicit funds from industry in any country without first contacting the National Adhering Organization in that country. Wording to this effect should be included on that part of the Advance Information Questionnaire to be signed by organizers requesting IUPAC sponsorship for a symposium. In any further correspondence it should be pointed out that this restriction was not imposed to prevent raising of money for a symposium but to avoid loss of industrial funds to IUPAC.

7. Date of Next Meeting

Depending on the dates for the Executive Committee meeting at that time, the Finance Committee would meet in Zürich on 17 and 18 February 1972.

INTERDIVISIONAL COMMITTEE ON NOMENCLATURE AND SYMBOLS

22 July 1971

Present: Prof. M. L. MCGLASHAN (acting Chairman), Prof. H. M. N. H. IRVING (Secretary), Dr. R. DYBKAER, Prof. O. HOFFMAN-OSTENHOF, Prof. N. LOZAC'H, Dr. M. A. PAUL, and Prof. P. E. VERKADE.

1. Prof. MCGLASHAN read a letter from the Chairman, Prof. K. A. JENSEN, regretting his inability to be present and expressing his wish to resign from Office.
2. Prof. IRVING proposed that Prof. MCGLASHAN should take the Chair: this proposal was accepted *nem. con.*
3. Prof. MCGLASHAN made a brief reference to the minutes of the meeting held on 4 July 1969 at Cortina d'Ampezzo. Prof. IRVING reported that Prof. HOFFMAN-OSTENHOF's proposal 'that the IUPAC Secretariat should supply a Minutes Secretary for meetings of the Committee' was considered unnecessary so long as the Committee itself had a Secretary.
4. A report was received from the Commission on Physicochemical Symbols, Terminology, and Units, describing progress in the preparation of new reports and collaboration with other Commissions dealing with thermodynamics, electrochemistry, spectroscopy, and surface and colloid chemistry. Much of the work in Washington had taken the form of joint meetings. Closer relationships had been developed with other bodies, e.g., ISO/TC 12 and the IUPAP-SUN Commission. The Comité Consultatif des Unités of the Comité International des Poids et Mesures had now given a seat to IUPAC and Prof. MCGLASHAN had been proposed to represent the Union.
5. The report by Dr. J. E. PRUE from the Commission on Nomenclature of Inorganic Chemistry, described the new edition of the *Red Book* which would appear later in 1971. The size would be roughly three times that of the 1957 edition with considerable increases in the sections dealing with coordination and boron chemistry and iso and polyions. Time had also been spent by the Commission on the names for transuranic elements, and nomenclature for elements with $Z > 105$ would be considered by a small working party. Problems had arisen in the nomenclature of organometallic compounds and interdivisional discussions had taken place which would, in time, lead to a set of tentative rules.
6. Members of the Commission on Nomenclature of Organic Chemistry asked for copies of the *Red Book*. This led to a discussion of the availability of copies of this and other IUPAC nomenclature publications. It was unanimously proposed that copies of all publications on nomenclature should be provided *gratis* to every Chairman, Secretary, and Titular Member of relevant IUPAC Commissions. The Chairman was asked to communicate this recommendation formally in writing to the Secretariat.
7. The Commission on Nomenclature of Organic Chemistry reported through Prof. LOZAC'H that organometallic nomenclature rules had been discussed jointly with the Commission on Nomenclature of Inorganic Chemistry with a view to early publication of tentative proposals. Difficulties had been encountered in the nomenclature of phosphorus compounds. Amongst other projects, nomenclature rules for steroids,

cyclitols, and carbohydrates had been prepared by Dr. CROSS. Prof. VERKADE amplified these comments. Reference was made to the high cost of the new edition of the *Blue Book*.

8. The Commission on Macromolecular Nomenclature reported through Dr. K. L. LOENING that tentative proposals for the nomenclature of polymers had been considered and the problems of repeating units discussed with Dr. CROSS in cooperation with the Organic Chemistry Division. Stereochemical problems were now becoming a concern of more than one Division of the Union. Contacts had been made with CBN (Dr. COHN), ACS (Chairman of Committee on Polymer Nomenclature), and ISO (Dr. KLYNE) who were present at relevant meetings.
9. Prof. IRVING, reporting for the Commission on Analytical Nomenclature, referred to two joint meetings with the Commission on Automation in Clinical Chemistry in which useful progress had been made. Among the projects which had been submitted for tentative approval were nomenclature reports on thermal analysis, on chromatography, a list of trivial names of analytical reagents (a project which originated from the first meeting of the Interdivisional Committee in Paris in 1965), recommendations on scales of working, and on the use of molarity and normality.

Referring to the last report, the Chairman said he hoped no document would be published which was in conflict with the *Green Book* and with the recommendations of other international organizations, especially concerning the mole.
10. Progress by the Section on Fermentation Industries, reported by Dr. A. F. LANGLYKKE, included a preliminary compilation of symbols and terminology and a glossary of terms, quantities, and units for fermentation technology which incorporated much of the *Green Book*.
11. The Committee on Teaching of Chemistry reported through Prof. J. A. CAMPBELL that there were proposals for the preparation of simplified versions of IUPAC nomenclature recommendations. In discussion it was pointed out that these would need to vary according to the level of sophistication of the reader, e.g., different treatments would be needed for school and university levels. The Committee was asked to consider organizing a meeting at which the whole philosophy of the project could be discussed since it seemed impossible for individual Commissions to proceed independently. Prof. CAMPBELL pointed out that a start could be made at the next ACS meeting in September 1971, relying on the present US Membership of IUPAC Nomenclature Commissions to provide lines of communication. It was requested that a copy of the minutes should be sent to Prof. R. W. PARRY.
12. The Clinical Chemistry Section reported through Dr. DYBKAER that its *Recommendation 1966* had been updated and a list of terms used in clinical chemistry was being prepared. There had been contacts with the Commissions on Physicochemical Symbols, Terminology, and Units and on Analytical Nomenclature and discussions on biochemical nomenclature. Prof. HOFFMAN-OSTENHOF, for the IUPAC-IUB Commission on Biochemical Nomenclature, reported that the nomenclature of enzymes had occupied a good deal of time and he commented on the need to reform the terminology and concept of units. Amino acids, peptides, and synthetic peptides, conformation of nucleotides, polysaccharides, and vitamin-like substances had also been considered.

13. Concerning the future programme there was a long and wide ranging discussion of the functions of the Interdivisional Committee and the ways in which these could be more effectively performed in future.
14. It was the unanimous opinion of Members present that the Interdivisional Committee served a useful and important function, but that its terms of reference and its powers of action should be more clearly defined. The following were among the views expressed:
 - (i) The Committee should not do any development work in nomenclature. Development work in the various fields of chemistry was done by the Nomenclature Commissions of the various IUPAC Divisions. It should be the function of the Interdivisional Committee to encourage these Commissions in their efforts, to review their reports with the object of preventing conflicts either within IUPAC or with other international bodies, and to coordinate their activities.
 - (ii) The Committee should encourage and promote nomenclature activities in needed areas where no expert group had as yet been organized.
 - (iii) The Committee should serve as the coordinating group for IUPAC nomenclature activities with those of other scientific unions (IUPAP, IUB, IUNS, *etc.*), as well as with those of other international bodies concerned with chemical nomenclature and symbols.
15. The considered opinion of the Interdivisional Committee was that it should meet during each IUPAC Conference and that the Chairman of each IUPAC Nomenclature Commission should be required to give a progress report. All nomenclature proposals, whether tentative or final (definitive) coming from individual Commissions (including the Committee on Teaching of Chemistry and similar bodies) should be laid before the Interdivisional Committee, to approve them, or if necessary, to refer them back for further discussion before they were submitted to the IUPAC Council (or Bureau) for publication.
16. It was recommended that the Membership of the Interdivisional Committee should be increased to include the Chairman and Secretary of all regular Nomenclature Commissions and similar representation for Divisions or Committees dealing with Clinical Chemistry, Biochemical Nomenclature, Chemical Education.
17. It was recommended that Nomenclature Commissions should meet prior to the main IUPAC Conference. The need for observers and cross-representation was appreciated; but it was stressed that such meetings could be held at locations where accommodation costs to IUPAC would be lower. Only Commission Chairmen and Secretaries would then need to go to the meeting of the Interdivisional Committee which should convene for a longer period than at present and consider reports in detail.
19. Prof. McGLASHAN was proposed as Chairman and Prof. IRVING as Secretary for the next two years.

SECTION ON CLINICAL CHEMISTRY

19 July 1971

Present: Dr. M. C. SANZ (Chairman), Dr. D. B. TONKS (Secretary), Prof. A. L. LATNER, Prof. P. LOUS, Prof. P. MÉTAIS, Prof. W. ROMAN, Prof. M. RUBIN (Titular Members); Prof. H. BÜTTNER, Dr. R. DYBKAER, Dr. J. C. NIXON, Dr. M. ROTH (National Representatives); Dr. J. FREI (IFCC).

1. The minutes of the previous meetings held at Geneva (September 1969) and at Stresa (April 1970) were approved. These had been circulated previously.

Prof. BÜTTNER suggested that copies of the minutes of Section meetings should be circulated to all National Representatives, as well as to Titular Members, even if the minutes were as yet unconfirmed. It was agreed that this should be done but that the minutes should be stamped with the words 'unconfirmed minutes'.

2. Business Arising from Minutes

(a) *Translation of Quantities and Units Commission Publications.* Dr. DYBKAER reported that a Spanish translation of *Recommendation 1966* had been prepared by Dr. BERTELLO (Argentina). Prof. MÉTAIS had made a French translation of a shortened version. A German translation would be difficult because equivalent wording was not available. Dr. DYBKAER added that translations were very difficult and in cases of conflict, the English version must be taken as official. Translations could take so long that new versions would appear before they could be completed. Copies of all translations and correspondence should always be sent to the IUPAC Secretariat.

(b) *Enzyme Units.* Dr. DYBKAER stated that he had attended two meetings of the IUPAC-IUB Commission on Biochemical Nomenclature, which was updating its publication of 1964 on enzyme nomenclature. The Commission had asked him to consider the problem of enzyme units and he had made proposals which were unacceptable. Some progress had, however, been made and the principles of *Recommendation 1966* had been accepted by the IUPAC-IUB Commission.

Dr. DYBKAER indicated that he was not a Member of the IUPAC-IUB Commission and had to apply each time to sit as an Observer. He asked if the Section Chairman could write to the Bureau, or better to the Chairman of the IUPAC-IUB Commission, to ask if a Member from the Section, not necessarily himself, could be appointed to the Joint Commission on a permanent basis. This was agreed to unanimously.

Prof. ROMAN asked if the question of a standard temperature had been settled. Dr. DYBKAER replied that it was considered this should be detailed in each method, since no agreement could be reached.

Prof. ROMAN asked if consideration could be given by the IUPAC-IUB Commission to the question of standardized enzyme abbreviations. Dr. DYBKAER stated that he was not in favour of shortened names and that he could not support their consideration by the Joint Commission. Dr. TONKS suggested that a more proper body to consider this problem would be IFCC. Prof. RUBIN agreed and said he would bring this matter before IFCC. Prof. ROMAN approved of this alternative action.

(c) *Automation Discussions.* Dr. SANZ had attended two meetings with representatives from the Commission on Analytical Nomenclature and agreement was being reached on a revised terminology. Cooperation was now

excellent. Reports by the Commission on Analytical Nomenclature and by the Commission on Automation in Clinical Chemistry were being revised. There would be further meetings and exchanges of information.

(d) *Structure of Section.* Dr. SANZ stated that the Section was not properly defined and this caused some difficulties. However, he did not feel that these difficulties were too important or interfered with its progress. Hopefully, the Section would be elevated to the status of a Division in the not too distant future. However, it must be shown that clinical chemistry was a permanent discipline and that it was making a definite contribution to society.

Dr. SANZ reported that the Section had been asked to reduce its Titular Members from 10 to 8 because of financial considerations. He thought that it should have a Past-President and a Vice-President (President-Elect). Dr. TONKS indicated that, as Secretary, he had found it rather difficult to operate because of lack of official guidelines for the Section.

Prof. RUBIN commented that the Section had never officially created a Section Committee and proposed that this now be done. He therefore *moved* that a Section Committee be established and that the present 10 Titular Members of the Section serve as the Members of the Section Committee with Dr. SANZ as Chairman and Dr. TONKS as Secretary. This was approved.

(e) *Interdivisional Committee on Nomenclature and Symbols.* Dr. DYBKAER stated that this Committee had not yet met. He therefore had nothing to report.

(f) *International Atomic Energy Agency and International Office for Analytical Chemistry.* Prof. BÜTTNER reported that he had met with Dr. MERTENS of IAEA. The latter had proposed to IUPAC and IFCC that an International Office for Analytical Chemistry be established. IUPAC had not yet decided if an Office could be established. An *ad hoc* Committee had been formed by IUPAC, with Dr. SANZ as one of the Members, to consider the financial implications of such an Office. This Committee had met and Prof. BÜTTNER had attended the meeting as an Observer.

Dr. SANZ reported that the Committee had proposed only an office, but not a laboratory, be established, since the necessary finance was lacking. This proposal had been sent to the Bureau. The Austrian Government had made a formal offer to provide space for a centre in Vienna.

3. Reports

(a) *Commission on Quantities and Units.* Dr. DYBKAER had previously submitted an activity report covering the period from April 1970 to June 1971. He commented on several aspects of that Report. Following a meeting with Prof. M. L. MCGLASHAN of the Commission on Physicochemical Symbols, Terminology, and Units, certain changes had been made to the shortened version of *Recommendation 1966*. The resulting document would be submitted for approval and publication as tentative recommendations of IUPAC.

Dr. ROTH asked if IUB approved of the shortened version. Dr. DYBKAER stated that unanimous approval had been given by the IUPAC-IUB Commission on Biochemical Nomenclature.

Dr. DYBKAER said that several meetings were being held during the XXVI IUPAC Conference and would be reported on later.

(b) *Commission on Automation.* Dr. SANZ had previously submitted a report for 1971. He stated that he had already presented a portion of this report under Item 2 (c). He explained that two documents had been produced which should be ready for publication as tentative recommendations after the

Washington Conference. He informed the meeting of the death of Dr. COTLOVE and stated that his work on the Commission would be sorely missed. He was being replaced by Dr. D. YOUNG (USA).

Dr. SANZ stated that two useful publications had appeared in *Pure and Applied Chemistry*, and suggested that those interested in automation should refer to them:

Recommended Nomenclature for Automatic Analysis, Vol. 21, No. 4 (1970)
Recommendations for Presentation of Results of Chemical Analysis, Vol. 18, No. 3 (1969)

Several meetings were being held at the Conference and good progress was being made. Details would be given in future reports.

(c) *Commission on Teaching*. The written report of Prof. RUBIN was submitted. He indicated that four half-day sessions were being held at the Conference and a format for the monograph on teaching of clinical chemistry had been approved. It was now possible to have the monograph ready for presentation at Copenhagen in 1972.

The Commission had agreed on future activities which would include the preparation of monographs on the training of technologists and technicians.

(d) *Report of Chairman*. Dr. SANZ briefly commented on his report for the Section to Council.

(e) *Report of Secretary*. Dr. TONKS stated that his duties were now much lighter because of the help provided by the IUPAC Secretariat. For example, the Secretariat looked after travel arrangements and claim forms, and provided a budget for the Section based on proposed meetings of the Section and its Commissions. However, there remained considerable correspondence to be carried out between the President and Secretary and various Members, concerning meetings and other activities. Also, activity reports and minutes of meetings had to be prepared.

Dr. TONKS added that he believed excellent progress had been made on all fronts in the past two years and that the Section was now in a good position to produce useful work consistently in the future.

4. New Business

(a) *Proposed Toxicology Commission*. Dr. SANZ read a letter from Dr. GALLAY, President of the Applied Chemistry Division, which proposed that the Section on Clinical Chemistry take over the area of clinical toxicology, the analysis of toxic substances in biological fluids and tissues. The letter stated that the Applied Chemistry Division would continue to look after the related problems of air and water pollution, but felt that clinical chemists were better suited to deal with clinical toxicology.

Dr. SANZ had replied favourably to Dr. GALLAY's letter, stating that he would place the matter on the agenda for this meeting. Dr. SANZ thought that an *ad hoc* committee of three persons would be established to study the matter and to present a report to the Bureau (this was the procedure recommended in By-law 4.1301 of the Statutes). It was agreed unanimously that clinical toxicology should be an activity of the Section, and if the *ad hoc* committee was established, that the three members be: TONKS, ROTH, and TRUHAUT, the latter being Chairman of the Section on Toxicology and Industrial Hygiene of the Applied Chemistry Division.

(b) *Future Meetings*. Dr. TONKS reported that it was hoped to hold future meetings as follows:

Section Committee—Copenhagen (June 1972), Hamburg (1973);

Commission on Teaching—Copenhagen (June 1972), Hamburg (1973);
Commission on Quantities and Units—Copenhagen (June 1972), Hamburg (1973);

Commission on Automation—Geneva (February 1972), Copenhagen (June 1972), Birmingham (April 1973), Hamburg (1973).

Dr. TONKS added that no additional expenses would be incurred because of a Section Committee meeting in Copenhagen, since IFCC had agreed to pay the expenses of the Chairman and Secretary of the Section.

(c) *National Representatives*. Dr. TONKS reported that several changes had been made in the National Representatives to the Section:

Dr. J. C. NIXON (Canada) replacing Dr. R. H. PEARCE
Prof. J. HOMOLKA (Czechoslovakia) replacing Prof. J. HOREJSI
Dr. A. FISCHER (Hungary) replacing Dr. I. HORVÁTH
Prof. K. JACOBSON (Portugal) replacing Prof. S. GOMES DA COSTA
Dr. F. L. MITCHELL (UK) replacing Dr. H. LEHMANN
Dr. R. S. MELVILLE (USA) replacing Dr. W. MASON

(d) *Representative from IUB*. Dr. TONKS announced that Prof. F. LUNDQUIST (Denmark) had been designated by IUB as its representative to the Section on Clinical Chemistry. Prof. LOUS was asked by Dr. SANZ to determine from Prof. LUNDQUIST the nature of his duties as IUB Representative, and to enquire about the feasibility of a similar appointment being made by the Section to IUB.

(e) *Elections*

Commission on Quantities and Units. An additional Titular Member, Prof. R. HERRMANN (Germany), was proposed by Dr. DYBKAER, otherwise the Commission would remain unchanged. This proposal was approved.

Commission on Teaching. Prof. RUBIN proposed that Dr. ROTH be added to the Commission as a Titular Member and Prof. ROMAN and Prof. DEFALQUE (Belgium) as Associate Members. These proposals were approved.

Commission on Automation. Dr. SANZ said that Dr. D. YOUNG (USA) was proposed to replace the late Dr. COTLOVE, and that Prof. WHITEHEAD should become Chairman. Prof. BÜTTNER (Germany) had been proposed as an Associate Member. These proposals were approved.

Section Committee. Dr. SANZ stated that the addition of a Past-President, with the requested drop in 2 Titular Members, would result in a serious reduction in the Section's experts. It was also felt that the total number of Titular Members in the Section and the Commissions had already been kept to a minimum by joint appointments, and thus expenses had always been low. Therefore it was proposed to elect a Section Committee of 9, including a Past-President.

Dr. SANZ indicated that Profs. RUBIN, RUYSSSEN, and DE WAELE were ineligible for another 4-year term. Also, Prof. ROMAN had asked that he be replaced by another Australian representative instead of undertaking a second 4-year term. In the absence of Prof. IVANOV he was not proposed for a second 4-year term.

The elections proceeded forthwith, with results as follows:

Elected for a second 4-year term—TONKS, LATNER, LOUS, MÉTAIS

Elected as Past-President—SANZ

Elected as new Titular Members—Prof. D. H. CURNOW (Australia), Dr. F. W. SUNDERMAN (USA), Prof. R. GRÄSBECK (Finland), Dr. M. ROTH (Switzerland).

Prof. RUBIN moved that four unsuccessful nominees be made Associate Members of the Section. These were: Prof. H. BÜTTNER (Germany), Prof. G. VANZETTI (Italy), Prof. C. HEUSGHEM (Belgium), Prof. A. DEFALQUE (Belgium). Dr. TONKS moved that Prof. RUBIN and Dr. J. FREI also be made Associate Members of the Section. Finally, Dr. LATNER and Dr. SANZ moved that Dr. DYBKAER and Prof. J. HOMOLKA (Czechoslovakia) be made Associate Members of the Section. All 8 proposals for Associate Members were approved.

Officers of Section. Dr. SANZ proposed Dr. TONKS as Chairman, which was approved. Dr. TONKS proposed Dr. ROTH for Secretary, which was approved. Finally, Prof. ROMAN proposed Prof. LOUS as Vice-President with the understanding that he would consider becoming President-Elect in 2 years time. This was also approved.

(f) *Acknowledgements.* Acknowledgement was made of the fine work over several years of Profs. RUBIN and ROMAN, retiring Titular Members who were present, and of Dr. SANZ, retiring Chairman. This acknowledgement was accompanied by a hearty round of applause.

COMMISSION ON QUANTITIES AND UNITS

18 and 20 July 1971

Present: Dr. R. DYBKAER (Chairman), Dr. B. H. ARMBRECHT, Dr. K. JØRGENSEN, Prof. P. MÉTAIS.

1. The provisional agenda was approved, but the sequence of items was rearranged in order to meet deadlines during the IUPAC Conference. The following was the actual sequence.
2. The minutes of the meeting at Stresa (April 1970) were confirmed.
3. The activity report to the Section Committee was confirmed.
4. The manuscript *Quantities and Units in Clinical Chemistry, Draft Recommendation 1971* had been circulated to Members. It was found that the style could be improved upon. This kind of thorough revision had not been anticipated, but it was felt that an improvement of style would be of merit in avoiding some pedantic criticism. The document was no longer regarded as just a condensed and revised version of *Recommendation 1966*, but as a new document in its own right. This change in view of the status of the document had been caused by rather extensive revisions in names for kinds of quantities.

Apart from linguistic and editorial corrections, the following major changes were made in the manuscript:

Table 1 (page 2) was substituted by a list of Abbreviations of References. In Table 3.5-1 (page 13) a column of symbols denoting dimension was added. The name 'number of particles' (page 18) was changed to 'number (of entities)'.

The name 'molar concentration' (page 23) was changed to 'substance concentration'.

The name 'particle concentration' (page 24) was changed to 'number concentration'.

The name 'particle fraction' (page 25) was changed to 'number fraction'.

The IUPAC Secretariat had kindly promised to retype the manuscript. Comments to the published *Draft Recommendation 1971* would be examined at the next CQUCC meeting (Copenhagen, 1972).

5. The manuscript *List of Quantities, Draft Recommendation 1971* was in the same state as the manuscript described under Item 4 and received analogous treatment. A list of Abbreviations of References was added. Other changes were necessitated by the decisions mentioned under 4 above, with the same arrangements for retyping, etc.

6. It was unanimously decided to ask the Clinical Chemistry Section Committee that the present Membership continue for a second period of four years and, furthermore, to ask for the appointment of a fifth Titular Member: Prof. R. HERRMANN (Germany), who had received instructions as regards the duties of Membership and who was willing to serve.

7. Supplementary Reports

(i) Dr. ARMBRECHT had contacted a number of chemists and clinical chemists in central US agencies (Communicable Disease Center, National Institutes of Health, National Bureau of Standards, National Committee for Clinical Laboratory Standards, Standards Committee of American Association of Clinical Chemists, Food and Drug Administration). They were asked to make suggestions for the *List of Quantities* and a few had done so. These

comments had served for additions to the present manuscript. Dr. ARMBRECHT had furthermore checked lists of quantities from commercial laboratories for suggestions for new entries and some had resulted in additions incorporated in the present manuscript. He reported on problems with the introduction of the metric system in USA, on the problem of having journals accept papers with correct nomenclature and, finally, gave a picture of the complexities in knowing which agencies administered which laws.

(ii) Dr. DYBKAER amplified certain items of the activity report (cf. also items 8-10).

(iii) Prof. MÉTAIS explained why the translation into French of the paper in *Clinical Biochemistry* [2, 227 (1969)] had not been published. The printer lacked a special type for the figure 1. Société Française de Biologie Clinique had offered to supply the IFCC Committee on Standards with the necessary number of copies of the translated paper for distribution to French-speaking associations. This generous offer was gratefully accepted and Prof. MÉTAIS was charged with conveying the thanks of CQUCC to the Société.

8. Item 7 in the activity report should be consulted concerning publications on quantities and units.

9. Dr. DYBKAER referred to the activity report item 9, regarding the activities of the IUPAC-IUB Commission on Biochemical Nomenclature.

10. The contacts with the Commission on Physicochemical Symbols, Terminology, and Units had been fully explained in letters to Members and in the activity report item 10. The consequent decision on 'particle concentration' was given under Minute 4.

11. The separate duties of the Commission (CQUCC) and the IFCC Committee on Standards, Expert Panel on Quantities and Units had been approved by IUPAC. CQUCC was concerned with definitions of quantities and units and with recommending names for quantities, whereas EP on QU (after approval by IFCC) secured the contacts with national clinical chemical associations for disseminating such recommendations.

12. The circulated manuscripts for new kinds of quantities were not discussed due to lack of time.

13. The future work of CQUCC was discussed and the following outline was approved. Dr. ARMBRECHT should try to define 'half-life' (using also the material from Commission VI.5.1 in *Information Bulletin* No. 40, 1971, pp. 27-28) and circulate the manuscript to Members. Dr. DYBKAER's already circulated manuscript for 'shear rate', 'shear stress', 'viscosity', 'relative viscosity', and 'surface tension' should be commented upon by mail. Dr. JØRGENSEN should define and circulate manuscripts for 'chemical potential', 'absolute activity', 'osmotic pressure', and related kinds of quantity (giving the death stroke to 'osmolarity'), 'ionic strength', and 'activity' with related kinds of quantity—cf. *Manual of Symbols and Terminology for Physicochemical Quantities and Units* 1970, items 2.4.25 through 2.4.34.

Prof. MÉTAIS, probably in collaboration with the proposed new CQUCC Member, should define and circulate manuscripts for 'absorptance', 'transmittance', 'internal transmittance', 'absorbance', 'absorption coefficient', 'molar absorption coefficient', and 'refractive index'—i.e. 'Manual' items 2.8.09, 2.8.11 through 15, and 2.8.19—as well as what should supplant 'specific absorption coefficient'.

Comments to the above mentioned manuscripts should be circulated to all Members within a month of agreed deadlines, permitting a second edition

with new comments before the final drafts for the next meeting. The eventual aim was to produce a new draft for a book substituting *Recommendation 1966*. Such a draft might, perhaps, be ready for the meeting in 1973.

14. The next meeting of CQUCC would be in Copenhagen for two days during June 1972.

COMMISSION ON TEACHING

15 and 17 July 1971

Present: Prof. M. RUBIN (Chairman), Prof. A. L. LATNER, Prof. P. LOUS.

The first day gave time for a thorough presentation of the material which the Commission had collected for the monograph on teaching of clinical chemistry. The format and the size of the reports from national bodies were decided upon, and updating and revision of the existing reports were arranged. On the second day most of the time was occupied by a profound discussion of the reports presented by sub-committees, giving recommendations for education and training of directors and senior staff in clinical chemistry laboratories. One set of recommendations especially concerned medical graduates, another set concerned nonmedical graduates. It was expected to have the monograph ready by June 1972.

The need for continuous activity of the Commission was discussed and several possible projects were submitted. It was proposed that Dr. M. ROTH (Switzerland) join the Commission as a Titular Member and Prof. W. ROMAN (Australia) and Prof. A. DEFALQUE (Belgium) as Associate Members.

PHYSICAL CHEMISTRY DIVISION COMMITTEE

16 July 1971

Present: Dr. G. WADDINGTON (President), Sir HARRY MELVILLE (Past-President), Dr. R. N. JONES (Secretary), Prof. E. U. FRANCK, Prof. J. JORDAN, Prof. M. L. MCGLASHAN, Dr. D. R. STULL, Prof. S. SUNNER.

I. Report on Divisional Activities

Dr. WADDINGTON referred to his report to Council on the accomplishments and ongoing activities of the six Commissions of the Division. In particular, he noted the high level of collaboration between Commissions on matters of symbols, nomenclature, and units and the need for full compatibility within IUPAC publications on such matters. He also noted the increasing need for communication between the Commission on Physicochemical Measurements and Standards and other IUPAC bodies on matters pertaining to reference and calibration standards. Regarding Membership the current moves to increase industrial representation and to hold membership to 8 were noted. Attention was also called to the need to conserve funds during the coming biennium.

2. Reports from Chairmen of Commissions

Written reports from Commission Chairmen were accepted. Comment and discussion were restricted to new or policy matters and to points of emphasis. *Commission I.1.* It was agreed that Appendices (on selected topics) to the already published *Manual of Symbols and Terminology for Physicochemical Quantities and Units* would best be published and distributed for the time being as independent pamphlets. These could be included as loose enclosures with the hard copy version of the Manual.

The compatibility of IUPAC recommendations with those of other international organizations was discussed. The membership of Prof. MCGLASHAN in a personal capacity of the Advisory Panel of ISO/TC 12 and the appointment of Dr. J. TERRIEN of the Bureau International des Poids et Mesures as an Associate Member of Commission I.1 greatly enhanced the possibility of the desired compatibility. It was noted that IUPAC now had equal status with IUPAP on the Metre Convention of BIPM.

Prof. MCGLASHAN noted most forcefully the need to avoid the use of conflicting symbols, nomenclature, and units in IUPAC publications. He also noted progress in efforts to gain recognition by the Conférence Générale des Poids et Mesures of the mole (symbol *mol*) as an additional base unit in the SI (Système Internationale).

Commission I.2. A publication entitled *Guide to Procedures for the Publication of Thermodynamic Data* had been prepared. It was agreed that after correcting a number of deviations from IUPAC recommendations, this publication should appear in *Pure and Applied Chemistry*. The Guide would be most valuable to authors and to referees and editors of primary journals.

The Director of the Thermodynamic Tables Project Centre at Imperial College had reported completion of tables of thermodynamic data for argon and that work was progressing on 19 other gases.

The publication of a first table by the CODATA Task Group on Key Values in Thermodynamics called attention to the need for a means by which CODATA documents could be referred to the relevant IUPAC Commission

before publication. It was agreed that this was a part of the larger general question of IUPAC-CODATA collaboration. Prof. SUNNER reported that considerable progress had been made on an informal basis in planning an Inter-Union Commission on Biothermodynamics. Leaders in this field from IUB, IUPAB, and IUPAC were involved.

Commission I.3. Publications completed or in progress were: (a) *Electrochemical Kinetics. Guidelines for Design of Mechanistically Significant Experimentation* [Information Bulletin No. 39 (February 1971)]; (b) 13 papers from the July 1970 International Symposium on Non-aqueous Electrochemistry in *J. Electroanal. Interfac. Electrochem*; (c) seven Plenary Lectures from the same conference in *Pure and Applied Chemistry* [25, 2 (1971)]; and (d) a draft version (jointly with Commission I.1) of an Electrochemical Appendix to the *Manual on Symbols and Terminology for Physicochemical Quantities and Units* should be ready for publication in tentative form late in 1971.

Work continued on methods for tabulating standard potentials and electrochemical thermodynamic data.

Collaboration with CODATA was provided in the area of chemical kinetics by the Membership of Dr. R. TAMAMUSHI of the CODATA Task Group on Data for Chemical Kinetics.

Commission I.4. Among completed activities, publication of the monograph *Characterization of Chemical Purity—Organic Compounds* (editor L. STAVELEY) was noteworthy. The three-volume report of the Ottawa Purity Symposium (1961) submitted by Drs. SAYLOR and WICHES would be condensed into a shorter publication by Dr. W. M. SMIT.

The Task Group on Standard Calibration Substances, hopefully to become the Sub-Commission on Calibration and Test Substances, was making excellent progress. It expected to hold another meeting in 1972.

Stimulative efforts with national standardizing laboratories continued in the effort to obtain improved tables for the absolute density and vapour pressure of water.

Commission I.5. Dr. JONES called attention to the rapid broadening in scope of the Commission which formerly was concerned largely with infrared spectrometry. Some evidence of this broadening was contained in the list of pending publications. Those complete or nearly so included: (a) *Recommendations for Presentation of Raman Spectra for Cataloging and Documentation in Permanent Data Collections*—published in February 1971 (Tentative Nomenclature Appendix No. 11 to *Information Bulletin*); (b) *Recommendations for Presentation of NMR Data for Publication in Chemical Journals*—ready for approval as a definitive recommendation; (c) *Tables of Wavenumbers for the Calibration of Infrared Spectrometers covering the range 600-3 cm⁻¹*—ready for publication; (d) *Tentative Specifications for the Measurement and Evaluation of Infrared Spectra for Documentation Purposes*—published as a tentative recommendation in 1969 and after minor reassessment to accommodate interferometric spectra would probably come forward for approval as a definitive document in 1973.

The Commission was working with Commission I.1 to improve Section 2.8 of the *Manual on Symbols and Terminology for Physicochemical Quantities and Units*. This Section, on *Light and Related Electromagnetic Radiation*, needed much discussion to achieve compatibility with other international groups.

Activities of Commission I.5 relating to Mössbauer and photoelectron spectroscopy would be considered at this Conference. An *ad hoc* Committee

on Mass Spectroscopy had studied the desirability of having mass spectroscopy represented in IUPAC. Recommendations on this subject would be made to the Bureau.

Commission I.6. Prof. EVERETT reported that the Colloid and Surface Chemistry Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was nearly complete. A similar publication on *Nomenclature for Heterogeneous Catalysis* was in preparation. A report on *Nomenclature for Zeolites and Molecular Sieves* was being worked on jointly with the Commission and IUCr.

A programme on standard samples for surface area determination had been started by the British Society of Chemical Industry and would be extended internationally by the Commission. Dr. WADDINGTON pointed to the need to coordinate this programme with the related and larger programme of Commission I.4.

Work on a source book for graduate and undergraduate use continued. The text should be complete in about two years.

Prof. EVERETT reported that Commission I.6 had been asked to cosponsor the 50th Anniversary Meeting of the Division of Colloid and Surface Chemistry of the American Chemical Society in 1976.

Plasma Chemistry. Sub-Commission I.2.1, chaired by Dr. C. W. BECKETT, was not yet ready to recommend formation of a Commission on Plasma Chemistry. It had recommended enlargement of the study group (Sub-Commission I.2.1) from 3 to 8 Associate Members and a like number of supporting experts. A Conference on Plasma Chemistry would be organized in connexion with the 1973 IUPAC Conference.

3. Data for Chemical Kinetics

Independent reports on the May 1971 Paris meeting of the CODATA Task Group on Chemical Kinetics were submitted to the Division by Dr. R. TAMAMUSHI and Dr. V. I. VEDENEV. The Task Group had asked Commission I.3 to discuss the definition of rate constants of electrode reactions. It was agreed that this should be done in conjunction with Commission I.1.

4. Mass Spectroscopy

A request from mass spectroscopists to IUPAC for formation of a mass spectroscopy body in the IUPAC structure was referred to the Division. Dr. R. N. JONES, Chairman of the three man *ad hoc* Committee set up to consider this request, reported that formation of a Sub-Commission on Mass Spectroscopy, attached to Commission I.5, would be recommended to the Bureau.

5. IUPAC-CODATA Collaboration

The subject of IUPAC-CODATA collaboration had been referred to the Division Committee. From the reports of the Commissions it was evident that there was a good deal of informal collaboration between the Commissions of the Physical Chemistry Division and the CODATA Task Groups. This was mainly as a consequence of the common membership of key individuals to both organizations. It was agreed after discussion that direct collaboration of a more formal character was desirable at the Commission-Task Group level; efforts to achieve this should be encouraged but it must be done in a manner which would not cause operational delays.

19 July 1971

The President again stressed the need to conserve funds because of anticipated deficits in 1972 and 1973. Not all requests for funds could be met at the level desired.

I. Membership Affairs

Division Committee. Dr. R. N. JONES was elected Vice-President to replace Prof. OVERBEEK who had resigned; Dr. S. SUNNER was elected Secretary; Prof. H. KIENITZ was elected (later by letter ballot) to replace Dr. D. R. STULL whose nomination to serve an additional two years was invalidated by reference to the By-laws.

Commissions. Commission I.1: a Titular Member position was being held open for a suitable candidate from USSR. Commission I.2: the membership of Sub-Commission I.2.1 (Plasma Chemistry), subject to Bureau approval, would be increased from 3 to 8 Associate Members. National Representatives might also be appointed. Commission I.3: Prof. R. HAASE was elected Chairman to replace Prof. J. JORDAN who resigned. Prof. H. KIENITZ was elected Chairman for a two-year term and Dr. D. AMBROSE as Vice-Chairman and Secretary for a four-year term. A suitable replacement for Prof. NOVIKOV would be sought from USSR. Commission I.5: Prof. N. SHEPPARD was elected Chairman. One Titular Member vacancy was left open pending establishment of the new Sub-Commission on Mass Spectroscopy. Commission I.6: Prof. C. KEMBALL was elected a Titular Member to replace Prof. M. PRETTRE who had resigned. Authorization given in 1969 for this Commission to have 9 Titular Members remained valid until 1973.

2. Commission Activities

Commission I.1. Action was requested and given by the Division Committee to publish in tentative form a revised and extended version of Section 2.8 of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units*.

It was agreed to forward to Council for formal submission by IUPAC to the October meeting of the XIVth Conférence Générale des Poids et Mesures, the current definition of the mole as an SI base unit with a strong plea for its adoption.

The Committee endorsed the appointment of Prof. MCGLASHAN as IUPAC representative to the Comité Consultatif des Unités of CIPM and to ISO/TC 12. It was agreed that appointments should be made biannually and that Commission I.1 should periodically review them in terms of the need to have the best possible representative(s) from IUPAC and at intervals to have some rotation of membership.

Commission I.2. The Division Committee approved for immediate publication in *Pure and Applied Chemistry*, subject to minor editorial corrections, the document *A Guide to Procedures for the Publication of Thermodynamic Data*.

It was agreed to submit to the Bureau a request that Sub-Commission I.2.1 on Plasma Chemistry be increased from 3 to 8 Members and 8 Associate Members. (This request was modified by subsequent Bureau action.) Also, Sub-Commission I.2.1 requested subventions in 1972 and 1973 in connection with meetings and a Conference in Germany in 1973. It was agreed to transmit to the Bureau a request for IUPAC action on the plan to establish an Inter-Union Commission on Biothermodynamics.

Prof. SUNNER, without a request for action, informed the Division Committee of the current negotiations between OSTI and the Thermodynamic

Tables Project Centre regarding future funding, and of the efforts of Dr. H. KEHIAIAN and others, to establish a project for Critical Evaluation and Tabulation of Thermodynamic Data for Fluid Mixtures.

It was agreed to ask the Bureau to examine the possibility of affiliation of the International Association for the Advancement of High Pressure Science and Technology as an Associated Organization of the Union.

The Committee endorsed the request for sponsorship of the IIIrd International Conference on Calorimetry in Austria in 1973 and approved the concept of a token contribution from IUPAC in support of this Conference which would be largely supported from Austrian sources.

Commission I.3. The Commission requested support for a meeting at Oxford in 1972 to finalize a draft of the Electrochemical Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units*. Members of Commission I.1 would also participate. This request for funds would be considered with other similar requests. The Committee urged a reduction in costs by limiting the meeting to those expressly involved in the work.

Commission I.3 asked the Division Committee to consider possible action concerning establishment of a Data Bank for Electrochemical Measurements. The Committee believed that IUPAC would not wish to be involved in the operational aspects of such an activity but might provide advice on request.

Commission I.4. The Committee endorsed the request for a change in name of the Physical Properties Task Group to Sub-Commission on Calibration and Test Substances. The Commission reiterated its hope that \$1,000 could be provided to support a meeting of the Sub-Commission in 1972 in the Netherlands.

The Committee endorsed the publication in definitive form of the *Catalog of Physicochemical Standard Substances* with minor changes and additions.

Commission I.4 (and Commission I.2) endorsed the recommendation of the Commission on High Temperatures and Refractories (II.3) that vapour pressure values for gold, silver, and cadmium as recently published by NBS be adopted as international vapour pressure standards. The Divisional Committee concurred in this action.

Commission I.5. *Tables of Wavenumbers for the Calibration of Infrared Spectrometers in the Range 600-3 cm⁻¹* was essentially complete. The Committee agreed to recommend it to the Bureau for immediate publication in *Pure and Applied Chemistry*.

The document *Recommendations for Presentation of NMR Data for Publication in Chemical Journals* had now completed the required eight-month review and the Committee agreed to recommend it to Council for publication in definitive form in *Pure and Applied Chemistry*. The document *Recommendations for Presentation of Raman Spectra for Cataloging and Documentation in Permanent Data Collections* would have completed the eight-month review in September 1971. Subject to incorporation of changes received the Division Committee agreed to request publication as soon as possible of this document. The document *Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data* had been completed and awaited only review by Commission I.1 concerning symbolism and terminology. The Division Committee would ask the Bureau to expedite its publication in tentative form as soon as possible.

Commission I.6. The Colloid and Surface Chemistry Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* had completed the eight-month review period. Sections 1.11 and 1.13 on *Rheology* and *Optical Properties* had been withdrawn and would be treated separately

as appendices. The Committee would recommend to Council publication in definitive form in *Pure and Applied Chemistry* of the Appendix without sections 1.11 and 1.13.

A request for support of an interim meeting in 1972 was noted and would be considered with similar requests from other Commissions.

3. IUPAC-CODATA Collaboration

The Executive Committee had asked the Division and its Commissions to consider the improvement of IUPAC-CODATA collaboration. Informal coordination already existed, notably between Commission I.2 and the Task Group on Key Values in Thermodynamics, between Commissions I.3 and I.6 and the Task Group on Chemical Kinetics, and between Commission I.5 and the Task Group on Computer Use.

It was agreed that better mechanisms were required to provide a two-way flow of information between Commissions and related Task Groups, between Commissions and the CODATA Central Office, and between concerned IUPAC bodies and the IUPAC Representative on CODATA. Attachment of a CODATA representative to a Commission would be a useful device if this could be done within the IUPAC Statutes. These thoughts would be conveyed to the Bureau for consideration.

COMMISSION ON PHYSICOCHEMICAL SYMBOLS, TERMINOLOGY, AND UNITS (I.1)

15 and 18 July 1971

Present: Prof. M. L. McGLASHAN (Chairman), Dr. M. A. PAUL (Secretary), Prof. M. FAYARD, Prof. W. JAENICKE, Dr. A. PEREZ-MASIÁ (Titular Members); Dr. J. TERRIEN (Associate Member).

15 July Plenary Session

I. Status of Commission Membership

The loss of LARS GUNNAR SILLÉN (23 June 1970) was noted with deep regret. For personal reasons, F. JELLINEK had submitted his resignation. R. G. BATES had been designated Chairman of Commission V.5 (Electroanalytical Chemistry) and hence would not be able to participate in the present meetings of Commission I.1. The vacancy in Titular Membership held open since 1969 for a possible successor to K. V. ASTACHOV had not been filled.

2. Developments since 1969 Meeting

The Chairman observed that the *Manual of Symbols and Terminology for Physicochemical Quantities and Units*, adopted by Council at the XXV Conference of IUPAC in Cortina d'Ampezzo, had been published in Vol. 21, No. 1 (1970) of *Pure and Applied Chemistry* after going through 11 stages of proof correction. It had been published also as a 'Green Book', for sale by Butterworths.

The Chairman reported that CIPM, at its meeting in October 1969, had drafted a resolution defining the mole as a base unit of the *Système Internationale* (SI). The definition was essentially the same as the one recommended by the Commission through IUPAC, and the draft resolution would be presented by CIPM as a recommendation to the XIVth Conférence Générale des Poids et Mesures in October 1971 for final adoption.

The Chairman reported also that IUPAC had been given a seat, to which he had been appointed, on the Comité Consultatif des Unités of CIPM.

The Chairman indicated that on personal invitation he had been appointed a member of the Advisory Panel of ISO/TC 12. This Committee, on Quantities, Units, Symbols, Conversion Factors, and Conversion Tables, rarely met in plenary session, and only the delegates of the national adhering organizations voted. However, nonvoting members of the Advisory Panel were called upon to express their opinions, and this privilege was influential. Subcommittee 2 (ISO/TC 12/SC 2) had met in Stockholm (1-3 June 1971), Prof. McGLASHAN attending for IUPAC, to consider a draft proposal to ISO on *Rules for the Use of SI Units, their Multiples and Certain Other Units*. This proposal was a revised edition of the document ISO/R1000, and would include the mole as a base unit of the SI along with certain other revisions. Scant attention was paid in the previous edition to the needs of chemists. The draft revision had been reviewed by the Advisory Panel, but a final version taking account of the comments received was not yet available.

A joint meeting of Officers of Commissions I.1 (M. L. McGLASHAN and M. A. PAUL), I.3 (J. JORDAN and J. KORYTA), V.3 (H. M. N. H. IRVING and T. S. WEST), and V.5 (I. M. KOLTHOFF) was held at the IUPAC Secretariat (31 March-1 April 1970) to discuss nomenclature and symbols for electrochemistry and electroanalytical chemistry. The meeting was productive, and the outlook for continued cooperation among these Commissions was very good.

3. Programme of Commission for Near Future

The following guidelines were discussed and approved:

- (i) No revision of the Manual, except the most trivial, would be undertaken for the next ten years or so.
- (ii) The Commission through joint meetings would assist other Commissions of IUPAC to produce specialized documents on symbols, terminology, and units for their respective fields; some of these documents might be appropriately issued as appendices to the Manual. (Joint meetings with Commissions I.2, I.3, I.5, and I.6 were scheduled at the present Conference.)
- (iii) The Commission would continue to strengthen the contribution of IUPAC to interdisciplinary aspects of its field.

4. Resolution on Mole

A resolution (Commission Document STU 71/1) was considered recommending that Council should convey to the XIVth Conférence Générale des Poids et Mesures its hope that the Conférence would adopt without amendment the draft resolution on the mole presented to it by CIPM. The resolution was unanimously approved for transmission through the Division of Physical Chemistry to Council.

5. Symbols and Terminology for Chemical Thermodynamics

Two draft documents (STU 71/2 and 71/3) prepared by the Chairman in anticipation of the forthcoming joint meeting with Commission I.2 were discussed.

One was a suggested Appendix II to the Manual, dealing with *Definition of Standard Thermodynamic Quantities*. The word 'standard' had been used with different meanings, and the document attempted to define it once and for all by means of algebraic formulae applicable to the different conditions of use (standard thermodynamic quantity of a substance B, of a component B of a gas mixture, of a component B of a liquid or solid mixture, of a solute B and of solvent A in a liquid or solid solution, and for a chemical reaction).

The other document contained observations on further problems relating to the symbols and terminology of chemical thermodynamics. The IUPAC names, 'Helmholtz energy' (A) and 'Gibbs energy' (G) were in conflict with ISO R31 names 'free energy' and 'Gibbs function', respectively, and with IUPAP-SUN Commission names, 'Helmholtz function' and 'Gibbs function', respectively. Furthermore, the IUPAP-SUN Commission continued to recommend symbol F , not A , for the former of these two quantities. As a step towards eventual uniformity, it was agreed that Prof. McGLASHAN should explore informally the possibility that the SUN Commission might be willing to accept the recommendation F , (A) if Commission I.1 of IUPAC would recommend A , (F). Furthermore, it was agreed that the question of Commission I.1's recommending the names, 'Helmholtz function or (Helmholtz) free energy', and 'Gibbs function or Gibbs free energy', be explored with Commission I.2.

A conflict existed in the names used by some chemists for the quantity $\{G(T) - G(0)\}/T$. It had been variously (and misleadingly) called 'Gibbs energy function' and 'Gibbs free energy function'. The Manual recommended the name 'Planck function' for $-G/T$ (and Massieu function for $-A/T$). New names and symbols were needed for the widely used quantities of a substance B:

$$\begin{aligned} &\{H^\theta(\text{B, 'state,' } T) - H^\theta(\text{B,c,0})/T\} - \{S^\theta(\text{B, 'state,' } T) - S^\theta(\text{B,c,0})\} \\ &\{H^\theta(\text{B, 'state,' } T) - H^\theta(\text{B,c,0})/T\} \\ &\{S^\theta(\text{B, 'state,' } T) - S^\theta(\text{B,c,0})\} \end{aligned}$$

or even more usefully, for the number obtained by dividing each of these quantities by R .

The notation ΔH_f^θ , and similar notation used by some chemists for other standard quantities of formation, was contrary to internationally accepted rules for forming symbols; the appropriate symbol should have the form, $\Delta_f H^\theta$, indicating that the symbol designating 'formation' modified the operator-symbol Δ , not the quantity-symbol H . Furthermore, the representation of state conditions was improved generally by the use of functional notation in preference to subscripts, e.g., $\Delta H(298.15 \text{ K})$, $\text{CO}_2(\text{g})$, and $\Delta_f H^\theta(\text{CO}_{2,\text{g}}, 298.15 \text{ K})$.

The Commission concurred that these matters called for joint discussion with Commission I.2.

Joint Meeting with Commission on Thermodynamics and Thermochemistry

15 July 1971

Commission I.1 was represented by M. L. MCGLASHAN (Chairman), M. A. PAUL (Secretary), and A. PEREZ-MASIÁ. All Titular Members of Commission I.2 attended.

Prof. MCGLASHAN reviewed the progress made by Commission I.1 in undertaking joint meetings with other Commissions, notably I.3, I.5, and I.6, to encourage extension by specialists of the IUPAC *Manual of Symbols and Terminology for Physicochemical Quantities and Units*. This was the first joint meeting with Commission I.2. Prof. MCGLASHAN reviewed progress also in collaboration of IUPAC with other international organizations concerned with symbols, terminology, and units. IUPAC was now represented indirectly on ISO/TC 12 by personal membership on its Advisory Panel of Prof. MCGLASHAN, who was entitled to speak before actions were put to vote by the statutory national members. ISO Recommendation R31 was about to be published in final form after ten years in preparation. IUPAC also now had a seat, where it formerly had only observer status, on the Comité Consultatif des Unités of CIPM.

Prof. SUNNER, Chairman of Commission I.2, reviewed the major activities and publications of his Commission. A Sub-Commission on Plasma Chemistry had been added. The *Bulletin of Thermodynamics and Thermochemistry* was now being published on a more formal basis, with headquarters at the University of Michigan.

Commission I.2 had named a working party on symbols, terminology, and units. Its members were F. D. ROSSINI, J. D. COX, E. U. FRANCK, and L. V. GURVICH. Prof. SUNNER raised the question of pressure to conform with recommendations of other international organizations, referring in particular to Prof. MCGLASHAN's suggestion to meet the SUN Commission of IUPAC part way by recommending A , (F) for the Helmholtz function or (Helmholtz) free energy if the SUN Commission would recommend F , (A) (where it now recommended F). Prof. MCGLASHAN noted that the SUN Commission was meeting in August 1971, and that the Advisory Committee of ISO/TC 12 was prepared also to entertain suggestions from IUPAC. Drafts of ISO Recommendation R 31 in future would be routinely transmitted to IUPAC for criticism, and should be reviewed by Commission I.1 jointly with other Commissions concerned.

Joint Meeting with Commission on Molecular Structure and Spectroscopy

16 July 1971

Commission I.1 was represented by M. L. MCGLASHAN (Chairman), M. A. PAUL (Secretary), M. FAYARD, and J. TERRIEN. Commission I.5 was represented by R. N. JONES (Chairman), A. R. H. COLE (Vice-Chairman), F. A. MILLER (Secretary), B. L. CRAWFORD, Jr., M. A. ELYASHÉVICH, E. FLUCK, A. HADNI, Y. MORINO, and N. SHEPPARD.

A position paper on *Recommended Names and Symbols for Quantities Used in Absorption Spectrophotometry* (Commission I.1 Document STU 71/10) had been circulated by Dr. JONES among a number of national societies and committees as well as individual spectroscopists, subsequent to the joint meeting in 1969 between representatives of Commissions I.1 and I.5. No adverse criticisms had been received and ASTM Committee E.13.04 in particular had discussed and formally approved the document. It consisted of suggestions for revising and extending Section 2.8 of the IUPAC Manual. After some discussion, the corrected draft was accepted by the representatives of Commission I.1 for approval by their Commission and joint transmittal through the Division of Physical Chemistry to the Bureau for action. A copy was included in the attached report from the Commission to the Division Committee. It was suggested that the SUN Commission of IUPAC be informed of these recommendations, which agreed generally with recommendations prepared by R. S. MULLIKEN for the SUN Commission's document.

Dr. JONES reported further that a tentative document on symbols and terminology for Mössbauer spectroscopy was in preparation, to be completed at the present Conference. A document for NMR spectroscopy had been published in tentative form, and was essentially noncontroversial. The field of photoelectron spectroscopy was to be explored.

Joint Meeting with Commission on Electrochemistry

17 July 1971

Commission I.1 was represented by M. L. MCGLASHAN (Chairman), M. A. PAUL (Secretary), and W. JAENICKE. Commission I.3 was represented by Titular Members J. JORDAN (Chairman), I. EPELBOIN, R. HAASE, G. MILAZZO, A. SANFELD, R. TAMAMUSHI, and Associate Members H. BRUSSET, W. J. HAMER, E. LEVART, and R. PARSONS.

Comment was requested on a new document on *Rates and Rate Constants of a Heterogeneous Reaction* (identified by Commission I.1 as Document STU 71/9). It had been drafted by Dr. R. TAMAMUSHI, a member of the CODATA Task Force on Data for Chemical Kinetics, with the feeling that electrochemists might be using rate terminology differing from that of other reaction-kinetics investigators. The document was intended to be incorporated with a general document on terminology for reaction rates in preparation by Prof. V. N. KONDRATIEV. Several corrections were suggested by the representatives of Commission I.1 (including changing 'moles of B' consistently to 'amount of B', and several other substantive changes). Prof. JORDAN requested that further criticism be communicated to him after the IUPAC Conference, with copies to Dr. TAMAMUSHI.

Prof. JORDAN reported that Commission I.3 had reviewed and corrected its document, *A Proposal of Electrochemical Definitions, Nomenclature and Symbols* (Commission I.1 Document STU 71/8) which had resulted from the 1970 joint meeting of Officers of Commissions I.1, I.3, V.3, and V.5.

Discussion focussed on whether the expression 'equivalent' should not be discouraged in terminology relating to conductance. It was agreed that a name and symbol for ionic conductivity was needed, distinct from Λ , molar conductivity of electrolyte; the symbol, λ_B , and name, 'molar conductivity of ionic species B', were recommended, with the understanding that ionic species B would always be specified and might refer to such ionic species as $1/2 \text{ Mg}^{2+}$ and $1/2 \text{ SO}_4^{2-}$ where appropriate. It was agreed that explanatory material was needed on the interpretation of the different kinds of transport number and of ionic conductivity (e.g., when ion pairs or incomplete dissociation might be present). However, it was not necessary for the purpose of this proposed Appendix to the Manual to assign specific symbols to the different kinds of transport number.

It was noted that the definition and use of emf (electromotive force) in chemistry differed from the definition and use of this quantity in physics and engineering. The standard potential of a cell as used in chemistry was actually a property of the cell reaction, and agreed in some cases, but not all, with emf measurements on an experimental cell. The Stockholm convention, in effect, interpreted how to write the reaction when the value of the standard potential of the cell was stated. Different symbols were possibly needed to distinguish between cell emf and electrode potential of the presumed cell reaction. The use of E for the former and ϵ for the latter was proposed.

Commission I.3 would take these and further criticisms into account in a further draft of the proposed Appendix.

Joint Meeting with Commission on Colloid and Surface Chemistry

18 July 1971

Commission I.1 was represented by M. L. MCGLASHAN (Chairman), M. A. PAUL (Secretary), and W. JAENICKE. Commission I.6 was represented by D. H. EVERETT (Chairman), H. VAN OLPHEN (Secretary), K. J. MYSELS, and G. SCHAY.

The document under consideration was a draft, corrected by Commission I.6 at the present Conference, of the *Manual of Definitions, Terminology and Symbols in Colloid and Surface Chemistry*, published in January 1970 as Appendix Number 3 on Tentative Nomenclature, Symbols, Units and Standards of the *Information Bulletin* (Commission I.1 Document STU 71/4).

Prof. EVERETT reviewed the quite extensive, substantive revisions that had been made in his Commission's document prior to and at the present Conference. He observed that the section on *Optical Properties* needed further study, and that Dr. R. N. JONES, Prof. H. BENOIT, and Dr. J. TERRIEN were being consulted. He reported also that fruitful discussion had been held with the electrochemists on electrochemical terms in colloid and surface chemistry. A revision of Section I.7, *Electrochemical Terms in Colloid and Surface Chemistry*, replacing pages 44-45 of the published tentative Manual, and referring to the forthcoming Appendix to the IUPAC Manual in preparation by the Commission on Electrochemistry, had been read and approved on behalf of the latter Commission by Dr. R. PARSONS. The representatives of Commission I.1 felt that the set of symbols presented in this revised section, unaccompanied by definitions, was unsatisfactory, particularly for certain of the quantities that had controversial backgrounds. They recommended leaving out the list of symbols and confining this section to an essay, beginning with the present essay on the double layer.

Prof. EVERETT called attention to postponement of the section previously included on *Rheology*.

Commission I.6 intended to request Council approval of the document in its present amended form, subject to further corrections of minor importance.

18 July Plenary Session

Titular Members attending were M. L. McGLASHAN (Chairman), M. A. PAUL (Secretary), M. FAYARD, W. JAENICKE, and A. PEREZ-MASIA.

The Chairman commented briefly on Commission Documents 71/5 and 71/6 relating to the resolution of conflicts in the physicochemical terminology used or recommended by the Commission on Atomic Weights (II.1) in its 1969 Report and by Commission I.1 in its Manual. A draft of the 1971 Report had been transmitted to him by the Secretary of Commission II.1 and he undertook to review it for what appeared to be only minor editorial corrections needed.

The Chairman brought up for discussion also Commission Document 71/7 containing comments by Prof. KONDRATIEV on certain items in the Manual. It was agreed that Prof. McGLASHAN should draft a reply to Prof. KONDRATIEV expressing the Commission's views.

The Chairman reviewed briefly the outcome of the Joint Sessions with other Commissions. He called attention particularly to the new document on *Rates and Rate Constants of a Heterogeneous Reaction*, transmitted by Commission I.3 (identified as Commission I.1 Document STU 71/9), noting that action was not called for at the present Conference but that he would communicate the views of Commission I.1 to Prof. JORDAN after the Conference. He brought up for approval by Commission I.1 (jointly with Commission I.5) the corrected revision proposed of Section 2.8 of the Manual. Approval was unanimous, and the document was transmitted through the Division of Physical Chemistry to the Bureau for approval.

The Titular Members present proceeded to consider recommendations for Commission Membership. Profs. McGLASHAN, BATES, and JAENICKE, each having served two consecutive four-year terms, were ineligible for reelection without a request for special approval by the Bureau. Successors to fill the vacancies left by Profs. SILLÉN, JELLINEK, and ASTACHOV also were to be nominated.

The outcome of the Commission's deliberations was nomination of the following Titular Members, subject to statutory approval by the Division of Physical Chemistry and the Bureau:-

Reelected for a second four-year term (to 1975): Prof. M. FAYARD, Dr. A. PEREZ-MASIA.

Reelected for a two-year term (to 1973): Dr. M. A. PAUL.

Nominated for four-year terms (to 1975): Prof. J. KOEFOED (Denmark), Dr. D. R. LIDE (USA), Dr. A. SCHUIJFF (Netherlands), Prof. K. G. WEIL (Germany), Prof. D. H. WHIFFEN (UK).

Dr. PAUL was elected Chairman and Prof. FAYARD was elected Secretary of the Commission, each for two-year terms extending to 1973.

The following new Associate Members were nominated: Prof. W. JAENICKE, Prof. M. L. McGLASHAN.

The Commission agreed that Prof. McGLASHAN should continue as official IUPAC representative on the Comité Consultatif des Unités of CIPM. He should continue also as Observer representing IUPAC on ISO/TC 12 (he held a personal membership on the Advisory Committee of ISO/TC 12).

The Commission on Symbols, Units, and Nomenclature of IUPAP was meeting (23-24 August 1971) in Sèvres. Prof. McGLASHAN designated Prof. FAYARD as IUPAC Commission I.1 Observer at that meeting.

COMMISSION ON THERMODYNAMICS AND THERMOCHEMISTRY (I.2)

15-18 July 1971

Present: Prof. S. SUNNER (Chairman), Prof. E. F. WESTRUM, Jr. (Secretary), Dr. J. D. COX, Prof. E. U. FRANCK, Prof. F. D. ROSSINI, Prof. S. SEKI, Prof. B. VODAR (Titular Members); Dr. P. HEYDEMANN, Dr. R. J. IRVING, Dr. H. KEHIAIAN, Prof. R. VILCU, Dr. I. WADSÖ (Associate Members).

1. An *ad hoc* Committee chaired by Prof. WESTRUM had been organized by the Commission after its 1969 meeting to prepare a resolution advising authors, editors, and referees on the publication of thermophysical and thermochemical data. The resulting document entitled *A Guide to Procedures for the Publication of Thermodynamic Data* (which had been circulated in advance to the Commission), had been ratified by all known calorimetry and/or thermodynamic groups, by relevant national and international conferences meeting in 1971, and by other groups (e.g., Commission I.1). Arrangements for its translation into French, German, Japanese, and Russian and for widespread publication, first in *Pure and Applied Chemistry*, had been made. The Commission ratified the edited penultimate version, and commended the Committee for the excellence of its endeavour.

2. *Sub-Commission on Plasma Chemistry.* Dr. BECKETT reported on the meeting at US National Bureau of Standards (12-14 July 1971). Many different types of plasma experiment (low-temperature, high-temperature, organic, inorganic, gaseous, and gas-liquid or gas-solid mixtures) from the viewpoints of synthesis, materials, research and the physical chemistry of elementary processes within the plasma had been discussed. Subsequently, the following goals were selected:

To establish contact between centres of activity throughout the world, to survey common technology and measurement techniques, and to explore standardizations as well as other possible means of developing useful international cooperation. In order to formulate and implement plans directed towards these goals, the following actions were recommended:-

- (a) The Sub-Commission on Plasma Chemistry should be continued.
- (b) Its Membership should be increased to 8 Members and 8 Associate Members.
- (c) Funding—\$1,200 in 1972 and \$2,200 in 1973, for travel subvention and administrative expenses should be requested.
- (d) A meeting on plasma chemistry should be held at or near Hamburg in August-September 1973.

3. Dr. WADSÖ reported on a meeting (15 July 1971) sponsored by IUB and IUPAB to consider whether an Inter-Union Commission on Biothermodynamics was a desideratum. The meeting, convened and chaired by Prof. J. T. EDSALL, concluded and recommended that such a group would be valuable and should be charged with the following responsibilities:-

- (a) to promote coordination between chemists, biochemists, and others now engaged in production, evaluation, and utilization of biothermodynamic data.
- (b) to strive for general agreement on presentation of data to facilitate combination of data from various sources. Although extant methods of compiling data were adequate for simple biological compounds, more complex compounds required provision of much more ancillary information to define the system adequately. Attention should be

drawn to needs for standardized nomenclature, an unequivocal definition of the system, characterization of the purity and identity of the compounds, rendering uniform the formulation of equilibrium constants, *etc.*

- (c) to recommend choice of standard conditions, specifications of concentrations, *etc.*
- (d) to indicate the urgent need for certain thermodynamic data which were presently largely or completely lacking.
- (e) to encourage extant data projects; to exert pressures for establishment of new ones in areas in which they were lacking.
- (f) to act as a catalyst in raising funds for data tabulations and experimental studies.

It was suggested that a Commission might be composed of say 9 Members (3 from each of the 3 sponsoring Unions). In order to provide at least one meeting per year an initial budget of \$8,000 per year was envisaged to cover travel expenses and administrative costs.

Unanimous support was given to the concept of such an Inter-Union Commission.

4. Dr. H. KEHIAIAN described a new project on the Critical Evaluation and Tabulation of Thermodynamic Data for Fluid Mixtures. The proposal involved publication of tabulated data in looseleaf form, covering:

- (a) newly measured thermodynamic data on fluid mixtures;
- (b) published thermodynamic data on fluid mixtures, converted to the new format by either the original authors or compilers;
- (c) critically evaluated thermodynamic data on fluid mixtures.

It was expected that the tables would be published by the Thermodynamics Research Center of Texas A & M University. Support for the project had already been offered by many leading workers on the thermodynamic properties of mixtures.

The Commission wholeheartedly endorsed the concept of the proposal and expressed the view that there would be no overlap with the other activities of the Commission. Indeed, the project would complement the work of the IUPAC Thermodynamic Tables Project. The Commission noted with approval the international nature of the project and hoped that work would proceed as rapidly as possible under the direction of Dr. KEHIAIAN. A report on the progress of the project would be welcomed by the Commission at its 1973 meeting.

5. In the absence of Prof. NEWITT (Chairman of the Task Group) Dr. ANGUS reported both on the present status of the Thermodynamic Tables Project and work at the Project Centre. Galley proofs of the tables on argon were available. The next set of international tables (for ethylene) was in course of preparation and was the subject of considerable industrial interest. Preparation of tables for helium and carbon dioxide should begin soon, and plans existed for other tables, but forward planning was hazardous.

In all, the Project had produced about twenty tables from many sources to be used in the preparation of internationally-agreed tables and more use might be made of these.

The project Centre was currently negotiating a new three-year grant with OSTI, which envisaged support at the present level but with greater emphasis on table making. The Imperial College staff member supervising the renewed

grant would be, with the agreement of all concerned, Prof. J. S. ROWLINSON. Prof. NEWITT would continue as Head of the Project.

6. Prof. SUNNER reported on the current status of the CODATA Task Group on Thermodynamic Key Values. The first set (Part I) of key values had been publicized for the consideration of the scientific community and would be finalized shortly. The Commission approved the selected values and commended the Task Group for its important achievements.

7. Prof. WESTRUM reported on innovations and extensions in scope of the *Bulletin of Thermodynamics and Thermochemistry* into macromolecular, biological, and coordination chemistry, as well as into organic systems, the conversion to computer-controlled indexing and printing, and the current financial status. He stated that \$1,500 advanced by IUPAC as 'seed-money' in the years 1966 and 1967 would soon be repaid to IUPAC in accordance with the original agreement. The Commission recognized the importance of increasing the price of the *Bulletin* for institutions as compared to University and personal subscribers in order to provide a more adequate financial base.

8. Prof. VODAR reported on the progress of *Experimental Thermodynamics*, Vol. II. Some 28 chapters involving a total of 45 authors had been undertaken. Except for 3 chapters without outlines and without an author, receipt of all manuscripts was anticipated by 31 December 1971. The remaining chapters were expected to be ready by January 1972. Prof. VODAR was now being assisted in the editorial work by Dr. B. LEINEIDRE.

9. Reports on the following recent conferences on calorimetry were summarized:

Experimental Thermodynamics, Exeter, April 1970—COX

Society of Calorimetry and Thermal Analysis, Tokyo, November 1970—SEKI

All-Union Calorimetry Conference, Moscow, June 1971—WESTRUM

Colloquium on Thermochemistry, Marseille, June 1971—WESTRUM.

10. Dr. ANGUS reported on the IInd International Conference on Calorimetry and Thermodynamics sponsored jointly by IUPAC and the Calorimetry Conference which was held at Orono, Maine (11–14 July 1971). The Calorimetry Conference and especially the local arrangements committee, headed by Prof. R. DUNLAP, were to be commended for the excellence of the planning and arrangements.

11. The advance planning for the IIIrd International Conference on Calorimetry and Thermodynamics to be held at Baden bei Wien in Austria (3–8 September 1973) prepared by Prof. F. KÖHLER, was discussed and applauded. The excellent facilities, scope, and preliminary arrangements were appreciated. Approval for scheduling of this Conference was granted.

12. Prof. VODAR reported on AIRAPT (International Association for the Advancement of High Pressure Science and Technology) and urged the Commission to seek the establishment of a formal link with this organization.

13. A report on the needs and situation relative to an international pressure scale was presented by Dr. HEYDEMANN. He considered that an international pressure scale to 25 kbar was desirable—but not yet urgent—and could not, in fact, be implemented at the present time. It was apparent from the ensuing discussion that pressure was recognized as an important constraint and parameter and that the Commission should concern itself with the needs and implementation of pressure scales from the high-vacuum range to 25 kbar, with primary emphasis on the lower portions of the high-pressure (kbar) scale.

14. The Commission meeting jointly with Commission I.1 received a report from Prof. MCGLASHAN on proposed formulations of nomenclature and symbolism for chemical thermodynamics. Because this was available both to Commission I.1 and I.2 only on the first day of meetings, there was no opportunity to study or to react intellectually to it. An *ad hoc* Committee to study these documents and advise the Commission, appointed by Chairman SUNNER, was composed of Prof. ROSSINI (Chairman), Dr. COX, Prof. FRANCK, and Dr. GURVICH. The Committee had been requested to report back to the Commission at its early convenience.

15. Dr. COX announced that a computer-based data store containing metallurgical thermodynamic data had been set up in the Division of Chemical Standards of the UK National Physical Laboratory. Enquiries for such data or for the solution of practical problems involving the data would be welcomed at NPL.

16. The Commission commended the *ad hoc* Committee (joint with Commission I.4) for its progress in matters pertaining to standard materials and encouraged a continuing endeavour. In addition, a joint session involving Commissions I.2 and I.4 was held to discuss activities of mutual concern to both Commissions. Dr. COX described needs for thermophysical standards and Prof. KIENITZ reported on thermal standards proposed by Commission I.4. Prof. SUNNER reported on the objectives and common concerns of CODATA and IUPAC Commission I.2 and in particular on the work of the CODATA Task Group on Key Thermodynamic Values. In retrospective consideration the Commission considered that liaisons of this sort would be of most value when circumstance demanded joint decision or action.

17. IUPAC collaboration with CODATA was discussed and the work of the Members of the Commission on the CODATA Task Group on Key Thermodynamic Data used as an example of a possible mode of providing expertise. Alternatively, the Commission would welcome CODATA identification of compilation, evaluation, or study needs in the realm of competence of the Commission.

18. The Commission reviewed its *modus operandi* and in general agreed to act in preparation for the 1973 meeting with the same procedures, but to request submission of (provocative) questions for discussion and draft resolutions to facilitate subsequent action to be sent with the advance distribution of informational material. The Commission reviewed its several hard-core activities, considered problems likely to need attention for the 1973 meeting, and the extent to which diversification was possible without loss of definite achievement.

The Commission also commended Prof. SUNNER for the excellence of his 50-year survey of Commission activities which served as a basis for discussion of important future directions for Committee endeavours.

19. The Commission reelected Profs. SEKI and VODAR for a second four-year term of Titular Membership.

SUB-COMMISSION ON PLASMA CHEMISTRY (I.2.1)

Gaithersburg, 12-14 July 1971

Following an *ad hoc* Committee report on plasma chemistry, submitted to the Bureau at Cortina d'Ampezzo in 1969, Council approved the formation of a Sub-Commission on Plasma Chemistry. At that time a meeting in July 1971 just prior to the XXVIth IUPAC Conference was proposed for the purpose of continuing the study of this area. Subsequently, funds (\$2,200) were allocated for this meeting, permitting partial subvention of travel expenses for invited lecturers. An attempt was made to obtain a broad representation of both discipline and geographical regions. Unfortunately, difficulties either with travel funds or other commitments prevented the attendance of some who were invited.

Current activities in plasma research were discussed at NBS Gaithersburg laboratories in eleven invited lectures and several informal panel discussions. The principal topics were organic and inorganic syntheses in plasma, kinetics and thermodynamics of ions in flames, reactions of energy-rich species in specialized plasma, kinetics of nonequilibrium electrical discharges in hydrogen, chemical and physical processes in heterogeneous plasma, high temperature fluid bed reactor, plasma chemistry in the materials sciences, compilation and evaluation of data relevant to plasma chemistry, laser production of plasma, and impact of controlled thermonuclear reaction research on plasma chemistry.

These topics were representative of some, but by no means all, of the research on ionized gases that might be considered within the scope of a plasma chemistry programme. Electrical discharges in low density gases or vapours employed in many chemical synthesis experiments and in specialized experiments for the study of atoms and radicals had very large departures from thermodynamic equilibrium. In higher density fluids the departures from equilibrium were relatively small, hence the term thermal plasma. Thermal plasma were also important in the materials technology aspect of plasma chemistry. Heterogeneous plasma were of particular interest in melting, processing, spraying or coating of refractory materials. Plasma properties of flames as they might affect flame inhibition (fire prevention) or as they might be utilized in magnetohydrodynamic experiments were other examples of thermal plasma.

Panel discussions were conducted on heterogeneous plasma and on the needs for physicochemical data required in the interpretation of either homogeneous or heterogeneous plasma. As mentioned above, heterogeneous plasma were of particular interest in materials technology of coatings and of processing refractory solids. Data requirements included atomic, molecular, thermodynamic, and kinetic data. Transition probabilities, dissociation energies, ionization potentials, and electron affinities of both neutral and ionized species were particularly important. The needs for such information exceeded the supply of evaluated data currently available or in progress at existing data centres.

The last session was introduced with a lecture on plasma chemistry in the materials sciences by Dr. J. R. HOLLAHAN. The lecture was followed by a panel discussion on cooperative programmes in plasma chemistry. The objective was to explore informally several subjects:

- (i) Need for starting regional committees and programmes similar to the Calorimetry Conferences.

- (ii) Adequacy of existing publications or need for new publications, such as monographs on experimental methods, symposia proceedings, journal of plasma chemistry, bulletin of plasma chemistry, questionnaire on profile of interest.
- (iii) Planning of a symposium on plasma chemistry in August 1973 near Hamburg, Germany.

Publication needs were discussed but action at this time was considered premature. A journal with about 100 papers per year might be possible according to a recent study; such a journal would bring together papers that were now widely scattered. It would help to establish the subject as a recognized discipline. However, it was stated that IUPAC was unlikely to be interested in a small specialized journal. A bulletin of plasma chemistry containing brief summaries of current research appeared to be a feasible mode of communication that would help to identify centres throughout the world. Symposium proceedings might be helpful in this respect; however, they were less satisfactory than a monograph on experimental methods for producing and characterizing plasma. The problems of standardizing plasma measurements were discussed. A need for guides for authors and editors on the more complete reporting of the information was considered.

A preliminary list of subjects was drawn up for the proposed meeting in 1973:

- (i) Heterogeneous plasmas ('high' and 'low' temperatures)
 - a. solid-gas reaction
 - b. catalysis
- (ii) Synthesis with plasma
 - a. homogeneous } organic
 - b. heterogeneous } inorganic
- (iii) Techniques for plasma study: characterization of plasmas
- (iv) Determination of energy distributions in plasmas (measurement and theory)
- (v) Social implications of plasma chemistry
- (vi) Elementary reactions in plasma chemistry

It was proposed to increase the Membership of the Sub-Commission to 8 Members and 8 Associate Members. Names of suitable persons were suggested for consideration by the Commission on Thermodynamics and Thermochemistry and Physical Chemistry Division Committee.

COMMISSION ON ELECTROCHEMISTRY (I.3)

15-18 July 1971

Present: Prof. J. JORDAN (Chairman), Dr. I. EPELBOIN, Prof. R. HAASE, Prof. G. MILAZZO, Dr. A. SANFELD, Dr. R. TAMAMUSHI (Titular Members); Prof. H. BRUSSET, Dr. W. J. HAMER, Dr. E. LEVART, Dr. R. PARSONS (Associate Members).

1. Minutes of Meeting in Paris (6-7 July 1970)

The minutes were ratified, as they appeared in print in *Information Bulletin* No. 39 (February 1971).

2. Electrochemical Appendix to Manual of Symbols and Terminology for Physicochemical Quantities and Units

A draft prepared by Prof. KORYTA and Dr. PARSONS was subjected to extensive and careful discussion by the Commission and also at joint meetings with Commissions I.1, I.6, and V.5. Comments submitted in writing by Profs. MEITES, TRÉMILLON, GERISCHER, FRUMKIN, BATES, ERDEY-GRUZ, and HAASE were noted. Revisions were agreed upon, including the following:

- (i) Instead of using the same general symbol for emf and all electrode potentials, different symbols should be used in order to emphasize the conceptual difference between emf (E), 'cell reaction potential' (ϵ), and electrode potential (U).
- (ii) Definitions of the concepts inner potential, outer potential, surface potential, electrochemical potential, and chemical potential would be reformulated.
- (iii) Definition of potential of zero charge was modified. Definitions of charge density, 'Grahame potential scale', differential and integral capacities would be added.
- (iv) It was decided to add the definition of ionic conductivity, $\lambda_B = Fu_B$.
- (v) The definition of mixed potential would be modified.
- (vi) Transfer coefficients would be defined in a general manner, and energies of activation of electrode reactions would be defined.
- (vii) In conjunction with the diffusion layer thickness the diffusion rate ($k_d = D/\delta$).
- (viii) A definition of electrode surface area would be given.

Dr. PARSONS would draft a document revised accordingly, which would be circulated for comment by the Membership of Commissions I.1, I.3, I.6, and V.5.

A meeting should be scheduled in Oxford in 1972 to finalize the Appendix in the light of comments received and to seek Executive Committee approval for preliminary publication in tentative form. It was hoped that final approval by Council could be obtained at the XXVIIth IUPAC Conference (1973).

3. Report from CODATA Task Group on Chemical Kinetics

A report on the meeting of the Task Group (Paris, 3-4 May 1971) was presented by Dr. TAMAMUSHI. Upon the request of the Task Group, the definition of electrochemical rate constants was discussed. The possibility was considered that an appropriate supplement be added to an authoritative CODATA

document by Prof. V. N. KONDRATIEV entitled *On Compilation and Assessment of Rate Coefficients for Chemical Reactions*. Commission I.3 was willing to cooperate with CODATA in this matter and also in compiling electrochemical kinetic parameters. Relevant contacts with CODATA would be maintained by Dr. TAMAMUSHI who would be in charge of this area of interest of Commission I.3.

4. Atlas of Electrochemical Kinetic Data

The progress of the compilation of electrochemical kinetic data was reported by Dr. TAMAMUSHI. Tables of data would be completed next spring and presented to the Commission for further evaluation.

5. Methods for Electrochemical Kinetics

A note on *Recommendations to Authors of Papers Dealing with Experimental Electrochemical Kinetics*, prepared by Prof. EPELBOIN and Dr. LESTRADE, was preliminarily discussed. It was decided to distribute copies of the note among Members of the Divisions of Physical Chemistry, Inorganic Chemistry, and Analytical Chemistry, asking for comments. Included in the EPELBOIN-LESTRADE document was the proposal to establish a computerized 'electrochemical data bank'.

6. Compilation of Electrochemical Thermodynamic Data

The present status of compiling electrochemical thermodynamic data was reported by Prof. MILAZZO, and a draft of representative tables was examined. The tables would contain as much information as possible. The work was nearing completion and it was understood that Prof. MILAZZO would continue collecting new data.

7. Critical Compilation of Standard Electrode Potentials in Molten Salts

An offer by Prof. S. A. PLAMBECK (University of Alberta) to cooperate with the Commission was accepted. This new project would be devoted to a *critical* presentation of the type of LATIMER's book. Approval would be requested from the Division Committee for this new project.

8. Miscellaneous

The following proposals were discussed: (i) definitions and nomenclature of electrochemical inhibitors (by Prof. FISCHER), and (ii) surface chemistry phenomena (by Prof. MINC). It was agreed that Commission I.3 would consider these proposals in its future programme. Prof. EPELBOIN would pursue the first proposal; Prof. MILAZZO and Dr. SANFELD the second.

Prof. EPELBOIN transmitted to the Commission a note by Dr. SCHULDINER (Naval Research Laboratory, Washington) containing comments relative to Item 5 above.

9. Membership

The following Titular Members were elected for a second four-year term: EPELBOIN, HAASE, MILAZZO, and for a two-year extension: TAMAMUSHI. New Titular Members were nominated as follows: Prof. N. IBL (Japan), Dr. R. PARSONS (UK), Prof. E. YEAGER (USA). Prof. HAASE was nominated as Chairman, Dr. PARSONS as Vice-Chairman, and Prof. MILAZZO as Secretary. New Associate Members were nominated as follows: Dr. R. L. DURST (USA),

Dr. J. C. JUSTICE (France), Prof. J. KORYTA (Czechoslovakia), Prof. D. MOHILNER (USA), Prof. S. A. PLAMBECK (Canada), Prof. Yu. V. PLESKOV (USSR).

The Commission passed unanimously a vote of thanks to the retiring Chairman, Vice-Chairman, and Secretary for the excellent work during their period as Officers.

COMMISSION ON PHYSICOCHEMICAL MEASUREMENTS AND STANDARDS (I.4)

15-18 July 1971

Present: Dr. D. R. STULL (Chairman), Dr. E. F. G. HERINGTON (Vice-Chairman and Secretary), Dr. I. BROWN, Dr. J. FRANC, Prof. H. KIENITZ, Dr. Y. MASHIKO, Prof. I. I. NOVIKOV (Titular Members); Dr. J. P. CALI, Prof. W. SIMON, Dr. J. TERRIEN (Associate Members); Mr. H. FEUERBERG, Dr. R. P. GRAHAM, Dr. W. M. SMIT (National Representatives).

1. The Commission made the following nominations:

- (i) *Titular Members.* Prof. H. KIENITZ reelected for 1971-1973 as Chairman; Dr. D. AMBROSE (UK) elected for 1971-1975 as Vice-Chairman and Secretary; Dr. Y. MASHIKO reelected for 1971-1975; Dr. P. CALI elected for 1971-1975; Dr. R. P. GRAHAM elected for 1971-1975.
- (ii) *Associate Members.* Dr. J. E. LANE (Australia), Dr. W. M. SMIT (Netherlands), and Dr. D. R. STULL.
- (iii) The Commission hoped that Dr. V. W. REID would be invited to serve as National Representative from UK.

The following verbal reports of actions arising from the minutes of the Cortina d'Ampezzo meeting (July, 1969) were presented.

2. Dr. HERINGTON reported on behalf of Dr. STAVELEY that the monograph *Characterization of Chemical Purity-Organic Compounds* had now been published (1971) by Messrs. Butterworths as a supplement to *Pure and Applied Chemistry*. Members of the Commission who had received copies expressed their appreciation for the excellence of the book.

3. To conform with the wishes of the Executive Committee, the Physical Property Task Group would hopefully be constituted as a Sub-Commission on Standard Calibration Substances. The Commission expressed a preference for Sub-Commission on Calibration and Test Substances and requested that this name be adopted.

The following items on the agenda were treated.

4. Dr. SAYLOR and Dr. WICHES tabled a copy of the report on the Ottawa Purity Symposium of 1961. As a result of detailed discussion, Dr. STULL agreed to make arrangements so that copies were available on demand. He would also see if a short summary embodying the salient numerical data could be prepared and published.

5. Drs. GRAHAM and CALI reported on a study of Differential Thermal Analysis (DTA) Standards of inorganic substances made by the International Confederation for Thermal Analysis (ICTA). The Commission valued this work and stated that extension to include organic substances melting in the range 20° to 200°C ought to be undertaken.

The Commission welcomed the issue of Standard Samples NBS-ICTA Numbers 758, 759, and 760 for use in DTA work, and requested that these three DTA Standards be included in the *Catalog of Physicochemical Standard Substances*. The Commission wished to encourage cooperative efforts of this kind between certifying laboratories and international bodies.

6. Dr. TERRIEN presented his report entitled *L'eau, étalon de masse volumique; conditions d'une haute précision*.

Dr. BOWMAN, who was accompanied by his associates JOHNSON and SAUNDERS from US National Bureau of Standards, gave an account of density comparisons made by hydrostatic weighing of spheres the diameter of which

had been accurately determined by the application of several precise measurement techniques.

Discussion included consideration of the effect of isotopic composition of water on density. The temperature range over which density was accurately known was also stated. The view was expressed that further measurements were necessary to obtain values on fully characterized water accurate to 1 or 2 ppm at temperatures up to 40°C, but if an accuracy of 10 ppm was acceptable present data was satisfactory.

7. Dr. WEXLER (NBS) gave an account of his paper with GREENSPAN who was also present, entitled *Vapour Pressure Equation for Water in the Range 0° to 100°C* which was to be published in *Journal of Research of the National Bureau of Standards*. Dr. WEXLER believed that extrapolation of his formulation to -100°C was warranted.

Dr. AMBROSE (NPL) presented his memorandum on the *Vapour Pressure of Water* and his report on the same subject with LAWRENSON. Their study had provided an expression covering the range from the triple point to the critical point. The vapour pressure over the temperature range common to both studies was in accordance with the measured data to better than 10 ppm.

The Commission welcomed both reports and wished to encourage Drs. AMBROSE and LAWRENSON to publish an account of their work. Drs. WEXLER and AMBROSE were asked to consult and correspond to explore the possibility for them to produce a combined report paying special attention to the vapour pressure in the temperature range 25° to 100°C, since this information was required for precise ebulliometry.

8. Dr. SMIT summarized his discussion note on the *Standardization of Temperature and Pressure* as conditions for physicochemical measurement.

The Commission recommended that 25°C (298.15 K) be used whenever possible for recording values of physical properties such as density and refractive index. Additional measurements should be reported at intervals of 5 K.

The Commission recommended that vapour pressure measurements be made at least at three pressures suitably spaced so that values could be interpolated over the range of use. The Commission further recommended that suitable pressure fixed points and methods for vapour pressure measurements be considered for discussion by this Commission in 1973.

9. Dr. TERRIEN gave a verbal report on the status of the Bureau Internationale des Poids et Mesures' programme on standard reference materials.

10. The Commission approved the publication in definitive form of the *Catalog of Physicochemical Standard Substances* subject to the addition of the three DTA Standards referred to in Item 5 of this report. The Commission recognized that the updating of this Catalog was its continuing responsibility.

11. IUPAC collaboration with CODATA was discussed and the following statement was agreed. IUPAC as well as CODATA recognized the need to establish special purpose working groups and that it was desirable that these bodies kept each other informed about specific needs. When CODATA identified the need for a compilation of evaluated data of a specific kind, Commission I.4 was willing to consider its capability to render assistance. It was the feeling that an interaction between these two organizations was desirable.

12. Prof. KIENITZ presented and discussed a written report on the progress of the work of the Physical Property Task Group. The twelve projects were:

(i) Density; (ii) Viscosity; (iii) Surface Tension; (iv) PVT Data; (v) Calorimetry; (vi) Transport Properties; (vii) Distillation Column Performance; (viii) Optical Properties; (ix) Dielectric Constants; (x) Potentiometric Ion Activities; (xi) Temperature Test Materials; (xii) Molecular Weight. A timetable was proposed for the steps necessary to prepare a collection of data sheets on the recommended calibration and test substances for study at the summer meeting 1972 (see Item 13).

The Commission instructed the captain (see *Information Bulletin* No. 38, November 1970, p. 26) of each team of the Task Group to prepare an explanatory critical summary for his section and to list in appendices materials not available from standardization laboratories.

The Commission also stated that it wished to draw the attention of Commission I.3 to the desirability of persuading national standardization organizations to adopt an internationally agreed pH scale.

13. To expedite the work of the Physical Property Task Group it was proposed to hold a meeting of major participants in Netherlands during the summer of 1972. Accordingly, Dr. STULL had made application for a grant of \$1,000 from IUPAC funds partially to defray expenses.

COMMISSION ON MOLECULAR STRUCTURE AND SPECTROSCOPY (I.5)

17 and 18 July 1971

Present: Dr. R. N. JONES (Chairman), Prof. A. R. H. COLE (Vice-Chairman), Prof. F. A. MILLER (Secretary), Dr. M. A. ELYASHÉVICH, Prof. E. FLUCK, Prof. A. HADNI, Prof. Y. MORINO, Prof. N. SHEPPARD (Titular Members); Prof. E. R. LIPPINCOTT, Prof. R. C. LORD, Dr. J. PLIVÁ, Sir HAROLD THOMPSON (Associate Members); Prof. B. L. CRAWFORD, Jr., Prof. M. L. JOSIEN, Dr. D. R. LIDE, Jr., Prof. T. SHIMANOUCI (Sub-Commission Members).

1. Tables of Wavenumbers for Calibration of Infrared Spectrometers from 600 to 3 cm^{-1}

A document on this subject was received from Sub-Commission I.5.1 and considered in detail. It was complete except for data for one band of DCN. These results were available but did not arrive in time for the meeting. When they were added and a few editorial changes made, the document would be finished. The target date was 30 September 1971. The Commission accepted the report and recommended that it be published promptly in *Pure and Applied Chemistry*. It was a definitive work with expert opinions fully taken into account, and it extended an already-published report which covered the range 4300 to 600 cm^{-1} [*Pure and Applied Chemistry* 1, 537 (1960)].

2. Recommendations for Presentation of NMR Data for Publication in Chemical Journals

This material had been published in January 1970 as Tentative Nomenclature Appendix No. 4 to the *Information Bulletin*. Several minor modifications had been made as the result of comments received. The Commission accepted the document as amended, and recommended that it be published promptly in definitive form in *Pure and Applied Chemistry*. There was a discussion on extending these recommendations to nuclei other than protons. SHEPPARD and FLUCK would constitute a task force, and would have a report on this matter no later than the 1973 meeting.

3. Recommendations for Presentation of Raman Spectra for Cataloging and Documentation in Permanent Data Collections

Sub-Commissions I.5.1 and I.5.2 presented a joint report on this subject. The material had been published in February 1971 as Tentative Nomenclature Appendix No. 11 to the *Information Bulletin*. Comments which had so far been received were discussed in detail. The modified document was approved and the Commission recommended that it be published promptly in definitive form in *Pure and Applied Chemistry* as soon as the eight-month waiting period expired in October. Any additional modifications would be dealt with by correspondence.

4. Recommended Names and Symbols for Quantities Used in Absorption Spectrophotometry

A joint meeting was held with Commission I.1 to consider the addition of some new material to Section 2.8 of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* [*Pure and Applied Chemistry* 21, 1 (1970)]. Later the Commission formally endorsed these additions and recommended their adoption.

ELYASHÉVICH would consult with HERZBERG to determine whether it would be desirable to make formal recommendations within IUPAC concerning spectroscopic notation.

5. Nomenclature and Conventions for Reporting Mossbauer Spectroscopic Data

A document on this subject was discussed in detail. It was accepted, and referred to the Physical Chemistry Division Committee with the recommendation that it be published promptly as a Tentative Nomenclature Appendix to the *Information Bulletin*.

6. Presentation of Spectral Data on Photoelectron Spectroscopy

The second draft of a report on this subject was received. It was decided that SHEPPARD and FLUCK would prepare a new version incorporating some suggestions: 1 November 1971 was set as a target date. The report would then be circulated to workers in this field for further comment.

7. Storage and Retrieval of Spectroscopic Data

The Commission considered means by which it might coordinate its activities with CODATA. It noted the overlap of interest between Sub-Commission I.5.2 and the CODATA Task Group on Computer Use and recommended that the Physical Chemistry Division Committee should seek an appropriate method to establish a suitable liaison between these two bodies.

Sub-Commission I.5.2 would examine the feasibility of organizing a symposium on the storage and retrieval of spectroscopic data.

8. Mass Spectroscopy

JONES stated that mass spectroscopists had asked for representation in IUPAC, and that the most logical place for them was in this Commission. It was generally agreed that if the Commission's activities were thus expanded, it would be desirable to form a new Sub-Commission on mass spectroscopy and make provision for one Titular Member from the parent Commission to be a mass spectroscopist.

9. Next Meeting

The next formal meeting of the Commission would be in Germany in 1973 in conjunction with the XXVIIth IUPAC Conference.

10. Membership

The composition of the Commission was considered and the following recommendations were made:-

- (i) The following Titular Members were elected for a second four-year term: ELYASHÉVICH, MILLER, SHEPPARD. Prof. SHEPPARD was nominated as Chairman.
- (ii) New Associate Members were nominated as follows: Prof. B. JEZOWSKA-TRZEBIAŁOWSKA (Poland), Prof. C. N. R. RAO (India).

- (iii) New Members were elected to Sub-Commission I.5.1 as follows: Prof. S. BRODERSEN (Denmark), Mr. H. A. WILLIS (UK), Prof. G. ZERBI (Italy). Prof. COLE was nominated as Chairman.
- (iv) The following new Member was elected to Sub-Commission I.5.2: Dr. K. FREI (Switzerland). Dr. LIDE was nominated as Chairman.

COMMISSION ON COLLOID AND SURFACE CHEMISTRY (I.6)

15-18 July 1971

I. Appendix on Colloid and Surface Chemistry to Manual of Symbols and Terminology of Physicochemical Quantities and Units

The text of this Appendix had been finalized and discussed in a joint meeting with Commission I.1. With the approval of Commission I.1 the manuscript was submitted for approval by the Division Committee and forwarding to Council for action. The present manuscript included all those Sections contained in Tentative Nomenclature Appendix No. 3 (January 1970) to the *Information Bulletin*, except for Sections 1.11 (*Rheology*) and 1.13 (*Optical Properties*). Later action on Section 1.11 would require prior consultation with nomenclature groups of the various national rheological societies, and on 1.13 with Commission I.5 and other interested parties. The Sections on Electrochemistry (1.7 and 1.8) had been discussed in a joint meeting with Commission I.3.

The Commission's working party on the Appendix on Heterogeneous Catalysis hoped to complete a draft tentative document for finalization in an interim meeting of the Commission in 1972. It was anticipated that this would then be submitted for publication in tentative form.

2. Nomenclature of Zeolites and Molecular Sieves

The working party would proceed with informal liaison with the Commission on Nomenclature of Inorganic Chemistry, IUCr, and the International Mineralogical Association. The intention was to have a tentative version ready for publication in 1973.

3. Liaison with ISO/TC 91 and CID

The present informal liaison through Prof. LANGE, who was a member of these organizations as well as an Associate Member of Commission I.6, was considered to be entirely satisfactory from the Commission's point of view.

4. Standard Reference Materials

- (i) *Surface Area Standards*. The Commission received a report on progress made in the pilot project being undertaken in UK jointly with the SCI and NPL. Satisfactory progress was noted. Informal contact has been made with Prof. KIENITZ so that Commission I.4 was kept informed of these activities. The US National Bureau of Standards had promised to cooperate in an extended project when this was appropriate.
- (ii) *Standard Catalysts*. Action would be taken to develop this project in collaboration with the Warren Springs Laboratory in UK.
- (iii) *Pure Surfactants*. The Commission recognized the need for surfactants of certified purity mainly for research purposes, and endorsed the initiative of the NAS-NRC Committee on Colloid and Surface Chemistry in this area.

5. Data Compilation and Evaluation: Liaison with CODATA

Present contact with the CODATA Task Group on Chemical Kinetics through Prof. SCHUIT was satisfactory. The Commission was willing to expand its cooperation if CODATA extended its activities to other areas of interest to the Commission.

6. Education

- (i) *Resource Book*. A substantial number of contributions had been promised. The deadline for receipt of contributions was the end of 1971. The Commission would keep the Committee on Teaching of Chemistry informed of progress on this project.
- (ii) *Educational Films*. A catalogue of films dealing with topics in colloid and surface chemistry had been prepared. The Commission considered that it would be useful to give this catalogue wide circulation among educational institutions and it sought cooperation with the Committee on Teaching of Chemistry regarding the best mechanism to be followed.

7. Sponsorship of Meetings

- (i) The Commission recommended that IUPAC should sponsor the 50th Anniversary Symposium of the ACS Division of Colloid and Surface Chemistry in 1976 and waive its publication rights.
- (ii) The Commission did not recommend sponsorship of the VIth International Congress on Surface Active Substances. The Commission had strong reservations regarding the likely quality of the papers, based on its knowledge of previous Congresses. It also considered that the publication procedures for the proceedings had been unsatisfactory.

8. Interim Meeting of Commission in 1972

The Commission considered an interim meeting in 1972 very desirable to enable it to complete discussion of the tentative manual on heterogeneous catalysis, and to review the status of the educational projects. It was hoped to arrange this meeting in association with the VIth International Congress on Catalysis, to be held 21–25 August 1972 at Miami Beach, Florida.

9. Membership

Approval for the Commission to have 9 Titular Members continued until 1973. The vacancy in Titular Membership caused by the resignation of Prof. PRETTRE was filled with Prof. C. KEMBALL (UK). The following Titular Members were elected for a second four-year term: BRUNAUER, VAN OLPHEN, SCHAY. New Associate Members nominated were Prof. J. E. GERMAIN (France) and Prof. K. TAMURA (Japan). The Commission felt it would be appropriate if Prof. J. HORIUTI was appointed the National Representative from Japan. It was noted with satisfaction the action taken by the British National Committee for Chemistry in appointing Sir ERIC RIDEAL as UK National Representative.

INORGANIC CHEMISTRY DIVISION COMMITTEE

16 July 1971

Present: Prof. O. GLEMSE (President), Prof. V. GUTMANN (Vice-President), Prof. R. COLLONGUES (Secretary), Prof. N. N. GREENWOOD, Prof. W. S. HORTON, Prof. L. MALATESTA, Prof. P. SPACU.

1. A moment of silence was observed in memory of Prof. DE BOER (Past-President) who had recently passed away.

2. Prof. GUTMANN requested the Commission Chairmen to provide full Membership lists for the meeting on 19 July and to provide too a short summary of the work of the Commissions for the report of the President of the Division to Council.

3. The Division Committee discussed and approved the preliminary reports of the Commissions and the agenda for each Commission Meeting:

- (i) *Commission II.1* (Prof. GREENWOOD). In particular, the following points were discussed: use of terms 'atomic weight' or 'atomic mass'—no further recommendation concerning use of the terms 'relative atomic mass' or 'atomic weight' should be made by IUPAC (Commission I.1) without first consulting the Commission on Atomic Weights; revision of atomic weight values—Prof. GREENWOOD would prepare a short report for the Committee on Publications.
- (ii) *Commission II.2* (Prof. FERNELIUS). The following points were discussed: nomenclature rules for boron compounds; refinements of nomenclature for fluorine chemistry; new elements beyond 105 should not be named by the discovering group after 1973; symbols for 106 and 105 should be recommended; collaboration with the Commission on Nomenclature of Organic Chemistry (Section D of *Blue Book*).
- (iii) *Commission II.3* (Dr. HORTON). The work of the Commission was in progress in determination of standards for vapour pressure (gold, silver, cadmium). Problems of publication of the *High Temperature Bibliography* and of overlap with other IUPAC bodies were discussed. A meeting of the Commission was planned for Paris in 1972: Dr. HORTON was required to provide justification for financial support.

4. Sponsorship of IUPAC was required for three meetings:

Phosphorous Chemistry (Prague 1973)

Non-aqueous Solvents (Vienna)

Boron Chemistry (a series of meetings to be held every 2-3 years)

The Division Committee recommended that the sponsorship of IUPAC be granted.

5. Compilation of bibliography in connection with publication of a report on the activities of the Division (letter from IUPAC Secretariat: 9 July 1971). The Committee and all Commissions approved the lists of publications for each Commission.

19 July 1971

1. The Division Committee discussed and approved the final reports of the Commissions. In particular, the following points were discussed:-

Commission II.1: changes in atomic weight values and presentation of data

Commission II.2: names for new elements, nomenclature of boron compounds, collaboration with Commission on Nomenclature of Organic Chemistry

Commission II.3: change in name of the Commission; choice of standards for vapour pressure

The Division Committee approved the elections in the Commissions.

2. The recommendations to Council from the Division Committee were the following:-

- (i) to approve the report by the Division President and the reports of the Commissions contained in it.
- (ii) to approve the recommended changes in atomic weight values and the recommended presentation of data.
- (iii) to approve a press release about the changes in atomic weight values as follows:

H	1.008 ₀	to	1.007 9
F	18.998 4	to	18.998 40
Na	22.989 8	to	22.989 77
Al	26.981 5	to	26.981 54
P	30.973 8	to	30.973 76
K	39.10 ₂	to	39.09 ₈
Zn	65.3 ₇	to	65.38
Cs	132.905 5	to	132.905 4
Ho	164.930 3	to	164.930 4
Bi	208.980 6	to	208.980 4

- (iv) to approve that no names be given for elements 104 and 105 before 1973.
- (v) to approve recommendations for the nomenclature of boron compounds for publication in definitive form.
- (vi) to approve a meeting of the Commission on Nomenclature of Inorganic Chemistry for 1972 in Europe (9 Titular Members, 6 days).
- (vii) to encourage cooperation between the Commissions on Nomenclature of Inorganic Chemistry and Organic Chemistry.
- (viii) to approve a meeting of the Sub-Commission on Organic Derivatives of the Elements in Autumn 1971 in London (4 Members, 2 days).
- (ix) to approve a change in name of the Commission on High Temperatures and Refractories to Commission on High Temperatures and Refractory Materials.
- (x) to approve the recommended choice of vapour pressure standards as follows:
'The Commission on High Temperatures and Refractories recommends the use of Au, Ag, and Cd as standards for testing apparatus and procedures for vapour-pressure measurements. These elements are considered at present to be the best reference materials, in the appropriate ranges of temperature and pressure.'
- (xi) to approve a meeting of the Commission on High Temperatures and Refractories in Paris in 1972 (6 Titular Members, 2 days).

(xii) to recommend that the International Association of Geochemistry and Cosmochemistry becomes an Associated Organization of IUPAC.

5. The following new Members were elected to the Division Committee: Prof. A. MAGNÉLI (Sweden), Prof. A. SWINARSKI (Poland), Prof. A. VLČEK (Czechoslovakia), Prof. K. YAMASAKI (Japan). Prof. MALATESTA was nominated as Secretary, and Prof. COLLONGUES became an ordinary Member.

6. The next meeting of the Division Executive Committee was planned for Italy.

COMMISSION ON ATOMIC WEIGHTS (II.1)

16-18 July 1971

I. Membership

The Chairman and Secretary were pressed to serve for a further term of four years: they had been in their Offices for only two years and had taken the responsibility for an increase in Commission activities to ensure contact with a diversity of new techniques that might give rise to significant new atomic weight values. For the same reason the Commission recommended an increase of Associate Membership not only by retaining the extremely valuable services of Dr. THODE and Prof. WAPSTRA, but also by a further increase of two Associate Members.

The following Titular Members were elected for a further four-year period: GREENWOOD, PEISER, FUJIWARA. New Titular Members nominated were: Prof. W. H. JOHNSON (USA), Dr. W. W. MEINKE (USA), Dr. A. A. SMALES (UK). New Associate Members were elected as follows: Dr. P. DE BIÈVRE (Belgium), Dr. N. E. HOLDEN (USA), Dr. H. G. THODE (Canada), Prof. A. H. WAPSTRA (Netherlands).

2. Report on Correspondence Concerning Nomenclature and Other Matters

- (i) The Chairman stressed the need for strict adherence to consistency in IUPAC terminology for publications as set down by the various nomenclature and terminology Commissions. The chief responsibility and hence the emphasis of the work of the Commission on Atomic Weights should be in the recommendation of atomic weight values. Naturally, the Commission was also concerned with definitions and it was well acknowledged that in this area there were real difficulties on which the Commission would work in collaboration with the Commissions on terminology, particularly that on Physicochemical Symbols, Terminology, and Units (I.1).
- (ii) The Chairman also reported on the parallel action by the Commission on Nomenclature of Inorganic Chemistry (II.2) on the subject of alternative two-letter symbols. The Commission on Atomic Weights strongly preferred the symbol *Id* rather than *Io* for iodine since the latter could cause confusion with ionium.
- (iii) The Chairman also reported on the current situation in naming of new elements. The Commission did not choose to make any recommendations at this stage but wished to be informed and consulted when recommendations for future usage were being framed.
- (iv) There was extended discussion on Dr. SELINOV's letter to the President of IUPAC concerning the merging of the IUPAC Commission on Atomic Weights with the IUPAP Commission on Relative Atomic Masses and Related Constants. In summary, Commission II.1 believed that the subject areas of the two Commissions were separate and required separate expertise. Excellent coordination between the two Commissions already existed.

3. Revision of Atomic Weight Values

The following changes in atomic weight values were recommended:

H	1.008 ₀	to	1.007 9
F	18.998 4	to	18.998 40
Na	22.989 8	to	22.989 77
Al	26.981 5	to	26.981 54
P	30.973 8	to	30.973 76
K	39.10 ₂	to	39.09 ₈
Zn	65.3 ₇	to	65.38
Cs	132.905 5	to	132.905 4
Ho	164.930 3	to	164.930 4
Bi	208.980 6	to	208.980 4

The above values were considered reliable to ± 1 in the last digit or ± 3 if that digit was a subscript.

The change in the value for *hydrogen* derived from a complex problem. The most likely value relevant to a laboratory sample was 1.007 97. Previously, the Commission had decided to round this off to 1.008₀. The final digit was not on line because the full range of normal hydrogen sources departed by more than .0001 from the above value because of variations in isotopic abundance. In consequence of the skew distribution of abundances of deuterium, 1.007 9 did encompass all normal samples. For this reason the Commission felt that this latter more precise value was preferable.

The change for *potassium* depended on a new analysis of old chemical data which gave them additional credence. The Commission now felt that the presently used mass spectroscopic data should not be the only basis for the published atomic weight value. Unfortunately, the two sets of chemical and mass spectroscopic data, whilst being self-consistent within each set, showed unexplained discrepancies between the two sets; for this reason the Commission decided to use a mean value rather than the mass spectroscopic value alone.

The new value for *zinc* depended on an accurate new coulometric method of considerable promise. Even on conservative estimates of uncertainties and unsuspected bias of the new techniques, an improvement in precision of the atomic weight value for zinc was possible.

Finally, new nuclidic mass data had led to improved accuracy of atomic weights of some mononuclidic elements.

The Commission had noted that the use of small digits to indicate an uncertainty higher than ± 1 in the last digit had led to difficulties in printing. For this reason the Commission now recommended that subscripts be used.

New data on isotopic abundances in unusual geological locations had made it desirable to add the footnote *g* to the elements *lithium*, *magnesium*, and *calcium*.

The Commission had decided to illustrate graphically the large range of relative precision of numerical values of atomic weights in the hope that this might help to make chemists more generally aware of the deficiency of data on such elements as gallium, germanium, molybdenum, cadmium, tin, rhenium, and osmium.

Some clarification in the wording of the footnotes to the Table of Atomic Weights was also made. Footnote *a* would in future be used only for stable nuclides. The use of the symbol A_r , recommended by the Commission on Physicochemical Symbols, Terminology, and Units (I.1), would be used with a distinction between the atomic weight for the element and that for any particular sample. The exact method to be used was being checked with Commission I.1. Finally, the footnotes would be modified so as to indicate more clearly their implications concerning the reliability of atomic weight values.

4. News Release of New Atomic Weight Data

The Commission strongly recommended early release to the technical press of new atomic weight values for the following reasons:

- (i) the wide interest in new values by scientists, editors, and publishers throughout the world;
- (ii) the consequent pressure on Commission Members to disclose such values;
- (iii) the undesirability of unauthorized leakage of data which might be incomplete or inaccurate;
- (iv) the difficulties caused to users by the fact that the new values were the *official* values immediately they were approved by Council, but would otherwise not be generally available until a considerably later date.

5. Extraterrestrial Materials

The Commission briefly discussed information on isotopic abundances in lunar and meteoric materials. The Commission emphasized that its atomic weight values were applicable only to terrestrial materials. Users should not use the values for meteoric material without knowledge of the literature on possible exceptional isotopic abundance variations.

6. New Techniques

The Commission was becoming more aware of a variety of new techniques which might yield significant atomic weight values. A report was given to the Commission on ion cyclotron resonance and nuclear magnetic resonance. The Commission concerned itself especially with trying to keep abreast with new physicochemical techniques which might be relevant to the subject of the Committee.

7. Items from General Discussion

Because most of the data were readily available elsewhere, the Table of Selected Radioactive Isotopes was to be deleted from the Report of the Commission, although some of the material was to be incorporated in an extended Table of Atomic Masses of Selected Isotopes. The basis for selection was to be as follows:

- (i) All stable isotopes of elements showing variability in isotopic composition as indicated by the footnotes would be included.
- (ii) Long-lived commercially available or scientifically common radioisotopes previously included in the tables (with the exception of ^{143}Pm) were to be included in the Table. For these elements half-life data from a well known collection would be given.

Information on the atomic weight of technetium was being withdrawn from the Table of Atomic Weights because the longer-lived isotope ^{97}Tc was also becoming available.

The Commission discussed the desirability of publication of an agreed simplified Table of Atomic Weights with modified footnotes and suggested that this problem be considered in collaboration with the Committee on Teaching of Chemistry.

The Chairman was able to report that the Commission on Atomic Weights at its 1971 meetings reached unanimous decisions on all substantive technical and procedural matters.

COMMISSION ON NOMENCLATURE OF INORGANIC CHEMISTRY (II.2)

15-20 July 1971

Present: Prof. W. C. FERNELIUS (Acting Chairman), Prof. F. GALLAIS (Cosecretary), Dr. J. E. PRUE (Cosecretary), Prof. R. M. ADAMS, Prof. J. CHATT, Dr. G. H. CHEESMAN, Prof. L. MALATESTA, Prof. A. ÖLANDER (Titular Members); Prof. L. F. BERTELLO, Dr. K. C. BUSCHBECK, Prof. Y. JEANNIN, Dr. W. H. POWELL, Prof. E. WEISS, Prof. K. YAMASAKI (Associate Members).

I. Names of Elements

For elements 104 and 105, the Commission reiterated the spirit of Minute 69/8 that these elements should not be named until five years had elapsed after the initial announcement of their discovery. The Commission did not wish to make a choice of name before July 1973 at the earliest. A special body might be necessary to adjudicate concerning the right to suggest names for these elements.

For elements beyond 105, the Commission unanimously recommended the adoption of a systematic nomenclature devised in advance. A majority of the Commission favoured a numerically derived system based on atomic numbers. Such a scheme devised by Profs. ÖLANDER and WEISS was submitted to the Commission for further consideration.

2. 1970 Rules (2nd Edition of Red Book)

Bound copies of the third proof were available for reading by Members of the Commission between meetings. Misprints were corrected and a few minor changes made. The Commission agreed that further definitive inorganic nomenclature rules should, when published, be identified as supplementary to the *Red Book*. This would not preclude their eventual incorporation in a further edition of the *Red Book*.

3. Boron Compounds

Comments received on the rules for nomenclature of inorganic boron compounds published in Tentative Nomenclature Appendix No. 8 (September 1970) to the *Information Bulletin* had been collected by Prof. ADAMS. They were fully discussed by the Commission. Prof. ADAMS agreed to make the appropriate changes in the tentative rules which would then be ready for publication in definitive form.

4. Highly Fluorinated Inorganic Compounds

A document had been submitted by Dr. J. A. YOUNG. It emphasized and illustrated the problems which arose in naming such compounds by existing inorganic or organic nomenclature systems. After discussion, a sub-committee consisting of Prof. FERNELIUS (Convenor), Prof. ADAMS, Prof. BERTELLO, and Dr. BUSCHBECK, was appointed to study the problem further and to make recommendations.

5. Organic Derivatives of the Elements

The Commission was not entirely satisfied with either the rate or form of progress in this joint responsibility of both Inorganic and Organic Nomenclature Commissions. The Commission was opposed to the abolition of the relevant Sub-Commission (II.2.1) until its job had been completed, and the

Convenor of the Sub-Commission, Prof. CHATT (Minute 63/17), was requested to arrange a meeting. The Commission unanimously resolved that:

'The Commission believes that the nomenclature rules for organic derivatives of the elements should be issued jointly by the two Commissions involved in the preparation of the relevant material, rather than as *Nomenclature of Organic Chemistry, Section D*. The borderline between organic and inorganic chemistry is rapidly vanishing, and the Commission feels that the publication policy for nomenclature rules in this borderline area should clearly reflect this state of affairs.'

Dr. PRUE was appointed to succeed Prof. MALATESTA on the Sub-Commission when the latter left Commission II.2.

6. Polyacids and other Inorganic Ring and Chain Structures

Dr. PRUE was requested to redraft tentative rule 4.3 for the nomenclature of iso- and heteropolyanions, which would not be published in the 1970 Rules, in accordance with the discussion in Cortina d'Ampezzo. A sub-committee, consisting of Dr. BUSCHBECK (Convenor), Dr. ADAMS, and Prof. JEANNIN, was appointed to study further the problems of nomenclature for inorganic chains and rings.

7. 'Problem' Structures

The possible names of a selection of recently prepared compounds were considered as a test of the applicability of existing rules and to locate areas requiring further attention. These included the nomenclature of homopolyatomic cations, cyclic phosphorus(V)-nitrogen compounds, ligand names, revision and extension of Table 2 of the 1970 Rules, cluster compounds, and complexes of unsaturated hydrocarbons with metals.

8. Nomenclature for Zeolites and Molecular Sieves (Natural and Synthetic)

Prof. ÖLANDER reported on the progress which had been made by the body set up under Minute 69/11.

9. Collective Names for Groups of Elements

The Commission, not having received any better suggestions, confirmed the decision of Minute 69/10 that "If group names are needed they should be triels (B, Al, Ga, In and Tl), tetrels (C, Si, Ge, Sn and Pb) and pentels (N, P, As, Sb and Bi), with trielide, tetrelide, and pentelide, respectively, for the binary compounds."

The Commission believed that the publication of Minute 69/10 in *Comptes Rendus XXV Conference* could be regarded as a tentative nomenclature recommendation, and that the recommendation should now become a definitive rule.

10. Topics Remitted for Further Consideration

- (i) A letter from Prof. D. W. A. SHARP, concerning the nomenclature of phosphorus compounds, was briefly discussed and referred to the bodies dealing with organic derivatives of the elements and with highly fluorinated inorganic compounds.

- (ii) Prof. YAMASAKI agreed to give detailed consideration to the nomenclature problems posed in connection with absolute configurations of coordination compounds.
- (iii) Dr. POWELL was likewise asked to investigate and report on the need for and use of 2-letter symbols for elements in connection with machine registration, *etc.*
- (iv) Dr. WEISS (in cooperation with C. J. LEIGH) was asked to study the nomenclature problems posed by cluster compounds.

11. Nomenclature and Teaching

In a discussion with Sir RONALD NYHOLM, the Commission agreed to give all the help it could to the Committee on Teaching of Chemistry.

12. Membership

This was discussed in a session restricted to Titular Members.

At the conclusion of the full meeting the following resolutions were passed unanimously:

“The Commission expressed its thanks to K. A. JENSEN for his services as Chairman and expresses the hope that he will continue with the Commission in the capacity to which he has been elected.

The Commission wishes to place on record its appreciation of the work that the retiring Members (CHEESMAN, GALLAIS, MALATESTA, REMY, and ÖLANDER) have done on behalf of the Commission.”

Dr. CHEESMAN expressed the thanks of retiring Members.

SUB-COMMISSION ON ORGANIC DERIVATIVES OF THE ELEMENTS (II.2.1)

18 July 1971

Present: Prof. J. CHATT (Convenor), Dr. K. L. LOENING, Prof. N. LOZAC'H, Prof. L. MALATESTA, Prof. P. E. VERKADE.

This meeting was called by Prof. CHATT at the request of the Commission on Nomenclature of Inorganic Chemistry, to discuss the present status of the joint publication of rules for the naming of organic derivatives of the elements.

The inorganic Members of Sub-Commission stated the unease of their colleagues concerning the alterations which had been made to the rules since they were last discussed by their Commission, and the apparent failure on the part of the drafting committee to take adequate action on their objections. After considerable discussion of the status and history of the Sub-Commission it was agreed, with some reluctance on the part of the inorganic Members, that the documents comprising the joint effort of the two Commissions should go forward for publication as tentative rules, after amendments to avoid violation of the nomenclature rules of inorganic and of organic chemistry. A sub-committee consisting of J. CHATT, L. C. CROSS, N. LOZAC'H, and J. E. PRUE, was set up to do this. If it did not prove possible to obtain agreement through relatively minor alterations to the text, it was suggested that the Inorganic Commission could register its dissent by statements to be inserted in the text of the tentative rules at the appropriate positions.

The future work of this Sub-Commission was considered. It was agreed that there were important areas of chemical nomenclature of concern to both Commissions which the Sub-Commission might consider. The Inorganic Commission was to define some problems for joint consideration.

COMMISSION ON HIGH TEMPERATURES AND REFRACTORIES (II.3)

15-17 July 1971

Present: Dr. W. S. HORTON (Chairman), Prof. G. D. RIECK (Secretary), Prof. C. B. ALCOCK, Prof. R. COLLONGUES, Prof. E. FITZER (Titular Members); Prof. F. CABANNES, Prof. G. DE MARIA (Associate Members); Dr. N. F. H. BRIGHT (National Representative).

1. Agenda and Minutes

After agreement on the agenda of the sessions to follow, the minutes of the meeting in Karlsruhe (24 April 1970) were corrected and confirmed. The draft minutes of the present and future meetings would be distributed by mail and voted on by mail confirmation by at least all Titular Members that were present at that meeting.

2. Correspondence

The Chairman had written letters of thanks to all members of the task forces and prepared a biennial report for the period 1969-71. The Secretary had written a letter of thanks to Mr. DIAMOND, the former editor of the *High Temperature Bibliography*.

3. Activities of the Commission

- (i) *Vapour Pressures*. The report of this task force initiated an extensive discussion on the meaning of the word 'standard'. In the strict sense, it would have to be an invariable property of a well-defined material, which could be measured reproducibly and accurately. In a broader sense, standards were materials that gave the most accurate values for a certain purpose.

As the materials which had been studied were carefully chosen by experts, the Commission agreed on the necessity to publish the report by IUPAC with the following resolution:

"The Commission on High Temperatures and Refractories recommends the use of Au, Ag, and Cd as standards for testing apparatus and procedures for vapour-pressure measurements. These elements are considered at present to be the best reference materials, in the appropriate ranges of temperature and pressure."

It was decided that, on the matter of standards and reports, voting could not be done by mail but, as discussion with experts was necessary, must be done at meetings. The task force would continue with measurements on W and Pt. After some discussion, the decision about including compounds such as oxides in the programme, was postponed to the meeting in 1973.

- (ii) *High Temperature Bibliography*. The Commission decided that a separate advisory board for the Bibliography was not necessary. The financial and organizational matters could be dealt with by the Chairman and Dr. M. HOCKING (editor). As changes in the Bibliography were expected to be infrequent, the Commission as a whole could deal with them.

The price of the four issues until March 1972 should remain at \$3.60 but, by charging \$3.60 for the next issues in 1972, the price would be \$4.80 per calendar year from 1 January 1973.

With regard to Prof. RIECK's memo on the Bibliography, it was decided to accept only the subdivision of section H (Reactions) and, although the proposed changes in sections D, E, and F were logical, to postpone further changes until 1973.

Dr. HOCKING would be asked if he was willing to look through the various contributions for obvious mistakes in the classification. Furthermore, it would be a great help to prevent mistakes if an instruction was given to the reviewers, with examples as mentioned by Prof. RIECK. The Bibliography might contain a separate page with current information on meetings, *etc.* (e.g., AGARD meeting in Turin, June 1972).

- (iii) *Limitations in applying Mass Spectrometry to High-Temperature Equilibrium Studies.* The manuscript by Prof. STAFFORD was discussed. Upon advice of specialists in the field, the Commission decided that the report represented a well-written individual view of the state of the art, but that it was not appropriate to be an official statement of its views or those of IUPAC. From this report it was clear that the subject was too complex for a simple treatment. Prof. FITZER, as editor of the journal *High Temperature-High Pressure*, offered to publish the paper as a worthy review article. The Commission believed that its publication would stimulate discussion among other experts in the field so that presentations on the subject might be forthcoming for the Hamburg Congress (1973).
- (iv) *Conference on High-Temperature Techniques.* This was to be part of the XXIVth IUPAC Congress (1973) in Hamburg and would be open to all those interested in the subject. Prof. ALCOCK proposed a three-day conference with the following six sessions:
 1. Generation of high temperatures
 2. Measurement of high temperatures
 3. Electrochemical (and other chemical) methods
 4. Calorimetry (and physical methods)
 5. Structure determination at high temperatures
 6. General discussion

The additions included in parentheses resulted from the wish of some Members to include kinetic methods. The Conference would restrict its field to the temperature range from 1000 K to 4000 K. Prof. ALCOCK would send a more detailed proposal to the Secretary.

- (v) *Hot Corrosion.* In view of a number of conferences in the near future on this field (e.g., April 1972 at Copenhagen), it was considered better to choose topics coming forward on those occasions for a conference initiated by the Commission. In the meantime, the Chairman would contact Dr. T. F. KEARNS (Naval Air Service Command, Washington) to point out the Commission's interest and willingness to cooperate.
- (vi) *Monograph on Carbon.* After a conference in 1972 in Baden-Baden (Germany), a meeting would be arranged by Prof. FITZER of some experts in this field. A possible guideline for the monograph could be:
 1. Definition of carbon in various states
 2. Selection of scientific methods for characterization
 3. Proposal of standards for various forms of carbon

Prof. FITZER was willing to write a monograph and the Commission could then decide whether it would be an IUPAC publication or not.

Profs. CABANNES, COLLONGUES, and RIECK pointed out that the same order-disorder problems occurring in carbon were present in other materials. Perhaps the procedures of characterization of carbon might have a general validity.

- (vii) *Newsletter*. The Newsletter that Dr. CUBICCIOTTI had composed was published by the American Ceramic Society but not by the American Chemical Society. Further, at least in Canada, Czechoslovakia, and the Netherlands, the Newsletter had been published but hardly any response had been received. Therefore, Dr. CUBICCIOTTI's recommendation to discontinue this activity was accepted, also in view of the fact that the Bibliography continued to appear. Dr. BRIGHT and Prof. COLLONGUES suggested that news items might be incorporated in the Bibliography. All Members were invited to send news items to Dr. HOCKING.
- (viii) *Standards for Melting Points*. Many members of the task force were willing to continue their work in this field. They had suggested the use of oxides such as those of yttrium, erbium, and zirconium, and of metals such as Mo, Nb, and Ta, as well as eutectics of carbides, as standards. Prof. COLLONGUES mentioned the nonstoichiometry of oxides above 2000°C, and Profs. FITZER and RIECK preferred the VI group elements to those of the V group, which dissolved gases readily, e.g., oxygen and nitrogen. Prof. CABANNES stated that about 2400°C would have to be the upper limit, but perhaps Dr. RUFFINO would be willing to use his special pyrometer for this work.

The Commission decided to ask Dr. FOEX to be the coordinator of a task force with Prof. CABANNES as liaison with the Commission. Prof. RIECK would enquire in a few places whether there was interest in measuring the melting point of Mo. The Chairman would write to Dr. FOEX and potential members of the task force.

(ix) *New Activities*

1. To get more contacts with industrial scientists in the Commission's field in some countries, it would be of help if a list of names of subscribers to the Bibliography according to country, could be made available.
2. Apart from carbon, a substance such as silicon nitride was an important compound with poorly-known properties. Profs. ALCOCK and FITZER would contact specialists and give a verbal report on this matter at the next meeting.
3. About the high-temperature X-ray work, Prof. FITZER would make a report on the state of the art at the next meeting. Prof. RIECK would then, if necessary, contact IUCr.
4. Phase diagrams at high temperatures were within the field of interest of the Commission and played a role in several of its activities. However, at present, it was not accepted as a new activity for its own sake.
5. Diffusion problems, as mentioned by Prof. CABANNES, were brought forward by Profs. FITZER and RIECK. At this moment, no activity was proposed but in 1973 this possibility would be reconsidered.
6. *Nomenclature*. Although there were no urgent problems in this respect, Prof. COLLONGUES pointed out that a handbook on the nomenclature of defects in solids proposed nomenclatures that were unacceptable to the Commission.

4. Organization Matters

- (i) *Name of the Commission.* This was discussed again. Prof. ALCOCK pointed out that "refractories" were bricks and slags of ill-defined composition, whereas the French word "réfractaires", according to Prof. COLLONGUES, would better cover the field of interest. It was proposed to ask for a change of name to "Commission on High Temperatures and Refractory Materials".
- (ii) *Overlap with other Commissions.* This had not occurred until now. The Chairman was keeping contact with other IUPAC bodies where it was considered important, e.g., Commission on Physicochemical Measurements and Standards.
- (iii) *Membership.* In 1973 the nomination of at least two new Titular Members would be necessary because Prof. COLLONGUES and Dr. HORTON would then have completed a second four-year term. It if was wished to extend the number of Titular Members in 1973 from 6 to 7 or 8, the Commission should request this before the XXVIIIth IUPAC Conference. Although several Members had frequent contacts with industry, the Commission was willing to add a special industrially-oriented representative to its Membership list.

Although the British National Committee for Chemistry had suggested to the Commission a candidate with applied chemistry background, this person was unknown to those present. However, Prof. U. COLOMBO (Institute Donegani, Novara) was suggested as a possible National Representative from Italy.
- (iv) *Meeting in 1972.* This was felt to be necessary in view of the many problems which must be discussed before the 1973 Congress and Conference took place in Germany. The Chairman would seek consent for a meeting in 1972, giving a summary of the business mentioned in these minutes and that to be done in 1972. Paris would be the best meeting place and a time of late September or early October was chosen.

ORGANIC CHEMISTRY DIVISION COMMITTEE

16 and 19 July 1971

Present: Prof. D. H. R. BARTON (President), Prof. G. OURISSON (Vice-President), Prof. A. KJAER (Secretary), Prof. P. D. BARTLETT, Prof. V. HEROUT, Prof. M. NAKAJIMA, Prof. P. YATES, Prof. H. ZOLLINGER.

At the Division Open Meeting on 19 July, Dr. ARIENS, Profs. BRUYLANTS, CAMPAIGNE, Mr. KLESNEY, Profs. KLYNE, LOZAC'H, Dr. LOENING, Prof. HOFFMANN-OSTENHOFF, Dr. RACHLIN, and Profs. VEIBEL and VERKADE were present.

I. Membership of Division Committee

It was proposed to reelect Prof. YATES for a further period of four years. Prof. OURISSON, at the second meeting, assumed the Presidency of the Division until 1973. Prof. KJAER was elected Vice-President to take up the Presidency in 1973. Prof. ZOLLINGER was elected Secretary until 1973. These elections were submitted to Council for approval. To the two vacancies left by Profs. BARTLETT and SHEMYAKIN, the Committee elected Prof. Yu. A. OVCHINNIKOV (USSR) and G. H. WILKE (Germany).

The Committee decided to coopt three persons representing the field of applied organic chemistry, to participate in its future activity. The Committee invited Dr. L. K. HEUSLER (Switzerland), Dr. J. L. W. MATHIEU (France), and Dr. H. O. SIMMONS (USA) to become Coopted Members.

2. Commissions

Commission III.1. (i) The Committee discussed the report submitted by Prof. VERKADE and expressed its gratitude to the Commission for its important work, including, *inter alia*, efforts to complete a tentative version of *Section D* of *Nomenclature of Organic Chemistry* (jointly with Commission II.2). The Division Committee agreed to recommend that a joint sub-committee of two Members each from the Organic and Inorganic Nomenclature Commissions should meet in London to complete the work on *Section D*. (ii) The Commission had suggested that the vacancies left by Dr. DYSON and Prof. VERKADE be filled by Dr. K. BLÁHA (Czechoslovakia) and Prof. W. KLYNE (UK), and that Prof. N. LOZAC'H become Chairman. Dr. K. HIRAYAMA (Japan) was nominated as an Associate Member. The Division Committee approved these nominations and passed them on to the Bureau. The Committee also agreed to seek special Bureau approval for an extension of the terms of office for Profs. LOZAC'H (until 1975) and VEIBEL (until 1973), and agreed to the reelection of Mr. KLESNEY and Prof. RIGAUDY for a second four-year period. (iii) The Division Committee recommended to Council that the following tentative nomenclature rules should now be made definitive:

- a. Cyclitol Nomenclature (IUPAC-IUB Commission on Biochemical Nomenclature and Commission on Nomenclature of Organic Chemistry) (tentative version: *Information Bulletin* No. 32, August 1968)
- b. A One-letter Notation for Amino Acid Sequences (IUPAC-IUB Commission on Biochemical Nomenclature) tentative version: *Information Bulletin* No. 32, August 1968)
- c. Nomenclature of Steroids (IUPAC-IUB Commission on Biochemical Nomenclature and Commission on Nomenclature of Organic Chemistry) (tentative version, *Information Bulletin* No. 33, December 1968)

- d. Nomenclature of Organic Chemistry, Section E: Fundamental Stereochemistry (Commission on Nomenclature of Organic Chemistry) (tentative version: *Information Bulletin* No. 35, June 1969)
- e. Nomenclature for Vitamin B₆ and Related Compounds (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: Tentative Nomenclature Appendix No. 6 to *Information Bulletin*, September 1970)
- f. Carbohydrate Nomenclature-1 (IUPAC-IUB Commission on Biochemical Nomenclature and Commission on Nomenclature of Organic Chemistry) (tentative version: Tentative Nomenclature Appendix No. 7 to *Information Bulletin*, September 1970)
- g. Abbreviated Nomenclature of Synthetic Polypeptides (Polymerized Amino Acids) (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 30, October 1967)
- h. Nomenclature Rules for Corrinoids (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 26, August 1966)
- i. Recommendations for Nomenclature of Synthetic Modifications of Natural Peptides (IUPAC-IUB Commission on Biochemical Nomenclature) (tentative version: *Information Bulletin* No. 27, December 1966)

(iv) In the Division Open Meeting Prof. VERKADE expressed his concern about the price of IUPAC publications on nomenclature. It was generally agreed that these documents should be available as cheaply as possible. Prof. VERKADE also expressed concern about the lack of dissemination of IUPAC nomenclature proposals. The Division Committee was in agreement with these comments. (v) In order to improve the utilization of IUPAC documents, it was suggested that a running index of nomenclature rules should be made available. This suggestion was received with general favour. It was further suggested to Prof. VERKADE that a short book, dealing with current nomenclature, which would be published at a reasonable price, might facilitate the general usage of correct nomenclature and would provide a valuable source of reference for the definitive IUPAC documents. Prof. VERKADE and his colleagues undertook to consider this proposal carefully. (vi) The President of the Organic Chemistry Division, speaking on behalf of all present, expressed to Prof. VERKADE the most grateful appreciation of the Division and of organic chemists in general for the magnificent and unprecedented contributions that Prof. VERKADE had so unselfishly made over several decades to the Commission on Nomenclature of Organic Chemistry.

Commission III.2. (i) The Committee discussed the detailed report submitted by the Commission on its recent activity and supported its plans for the immediate future, notably with regard to finding ways of putting the organization of chemotaxonomy on a more permanent, international footing, and to working constructively for improvements in the publication and retrieval of information in the field of chemotaxonomy. (ii) The Committee noted that preparations for the international symposium on Chemistry in Evolution and Systematics, to be held in Strasbourg (3–8 July 1972) under the auspices of IUPAC, were well in hand by an organizing committee, with Prof. KJAER as Chairman. The organizing committee had asked the Division Committee for its support of a request for waiving the IUPAC rights of publication of the plenary lectures. The Division Committee supported the proposal and transmitted it to the Committee on Publications. (iii) The Division Committee approved the plans of the Commission to meet in Hamburg in 1973, and to allocate funds to cover expenses associated with the international circulation

of a newsletter. (iv) The Division Committee suggested that the original title of the Commission, "Chemical Plant Taxonomy", be changed to "Chemical Taxonomy". The suggestion was accepted by the Commission. (v) The Commission asked for approval of the nominations of Profs. W. F. GRANT (Canada), A. LÖVE (USA), and B. L. TURNER (USA) as Associate Members. Approval was given and passed on to the Bureau.

Section III.4. (i) The Division Committee invited the Chairman and Secretary of the Section to the meeting on 16 July to hear a spoken report on the important and diversified activities of the Section. The Committee promised to be of help in seeking advice through Commission III.1 on proper naming of new synthetic drugs, periodically listed, in a inconsistent way, by the agency of WHO. In a joint meeting with Commission III.1 the desired contact was established. (ii) The Division Committee approved the nominations of Dr. M. PROTIVA (Czechoslovakia) as a Titular Member, and of Profs. Y. BAN (Japan) and E. MUTSCHLER (Germany), and Drs. N. ANAND (India), J. CAVALLA (UK), and J. THUILLIER (France) as Associate Members.

3. Sponsorship of Symposia

Approved Symposia. The Committee noted with pleasure the approval by the Bureau (Executive Committee) of the following symposia:

- VIIIth Natural Products—New Delhi (1972)
- Chemistry in Evolution and Systematics—Strasbourg (1972)
- IIIrd Photochemistry—Karlsruhe (1972)
- Ist Physical Organic Chemistry—Crans sur Sierre (1972)
- IIIrd Carotenoids—Cluj (1972)

The Committee agreed to a postponement of the symposium on Chemistry in Evolution and Systematics, originally planned for 1971, until 1972. The Committee proposed a subvention of \$2,000 for the Photochemistry Symposium 1972. Subventions for the other symposia had already been decided by the Bureau.

New Symposia. (i) *Symposium on Synthetic Methods of Organic Chemistry, 1974.* Because Prof. C. H. EUGSTER (Switzerland) was unable to take responsibility to organize the symposium in March, Prof. A. BRUYLANTS (Louvain) indicated that it might be held in Belgium. In addition, Prof. NAKAJIMA was willing to discuss the possibility to hold it in Japan. He would inform Prof. OURISSON, who would also be in contact with Prof. BRUYLANTS. The Committee emphasized the importance of the field of this symposium for organic chemistry. (ii) *IXth Natural Products, 1974.* Several places for this symposium were discussed. The President of the Division would make the appropriate contacts. (iii) *IInd Physical Organic Chemistry, 1974.* Location open. (v) *Pyrimidine Chemistry.* This had been proposed by Section III.4 for 1972 at a location in USA. The Committee approved the proposal. (vi) *Organic Chemistry of Enzymes, 1974.* The Committee decided that a symposium on this subject was timely. It should be discussed with potential organizers, possibly Dr. G. LOWE (Oxford University). IUB should be kept informed.

4. Other Business

Observations and Recommendations. After extensive discussion, the Division Committee decided to make the following observations and recommendations:

- (i) The Division of Organic Chemistry regrets to see an unnecessary proliferation of journals devoted to publication of the organic chemical literature.
- (ii) The Division of Organic Chemistry recommends that titles and summaries should be written in such a way as to facilitate information retrieval by including all the important keywords.
- (iii) The Division of Organic Chemistry proposes consideration by the appropriate authorities that when a *preliminary communication* is submitted it should be accompanied by a fully detailed experimental section which would be available to the referees, but which would not be published. In addition, a copy of this experimental section would be available on payment of an appropriate sum to the publishing journal or to the author.

The latter recommendation was circulated to the other Divisions and generally favourable comments were received. It would be brought before Council for consideration.

COMMISSION ON NOMENCLATURE OF ORGANIC CHEMISTRY (III.1)

15-17 July 1971

Present: Prof. P. E. VERKADE (Chairman), Mr. S. P. KLESNEY (Secretary), Dr. L. C. CROSS, Dr. K. L. LOENING, Prof. N. LOZAC'H, Prof. J. RIGAUDY, Prof. S. VEIBEL (Titular Members).

1. Nomenclature of Natural Products and their Derivatives

It had been felt that in many fields an effort should now be made similar to the ones accomplished for steroids and carbohydrates. The contemplated rules would contain a general introduction stating standard nomenclature principles in the field of natural products. More specialized sections, on the other hand, would give the names and numberings of fundamental structures of a given group of natural product.

In this connexion, a meeting with some Members of the IUPAC-IUB Commission on Biochemical Nomenclature permitted the solution of some particular points on the nomenclature of carbohydrates.

Moreover, it had been agreed that a simplified text for cyclitol nomenclature would be proposed for definitive publication.

2. Section D of Nomenclature of Organic Chemistry

This Section was now being edited with the desire to see it published as soon as possible. Some problems having been raised from the side of the Commission on Nomenclature of Inorganic Chemistry, a special meeting was held on 18 July by representatives of the two Nomenclature Commissions (see p. 140). The way in which these questions should be solved was agreed upon and it was hoped that, before the end of the year, rules for Section D would be available for publication on a tentative basis.

3. Membership

Further renewal of the Memberships of Prof. VERKADE (Chairman) and Dr. G. M. DYSON was not requested. The appointment of Dr. K. BLÁHA (Czechoslovakia) and Prof. W. KLYNE (UK) as Titular Members and of Dr. K. HIRAYAMA (Japan) as an Associate Member was proposed to the Division Committee. It was also proposed that Prof. N. LOZAC'H should replace Prof. VERKADE in the office of Chairman.

4. Future Work

The Commission wished that *Section D*, after publication on a tentative basis, should be made definitive as soon as possible. Amendments of some parts to finalize *Section E: Fundamental Stereochemistry* would also require the attention of the Commission.

Apart from the preceding topics, concerning mainly finalization of previous work, it appeared that two new enterprises would now require rapid and efficient consideration:

- (i) a general nomenclature for natural products;
- (ii) a condensed version of *Nomenclature of Organic Chemistry: Sections A, B, and C* (1971).

COMMISSION ON CHEMICAL PLANT TAXONOMY (III.2)

17-18 July 1971

Present: Prof. A. KJAER (Chairman), Dr. T. SWAIN (Secretary), Dr. J. B. HARBORNE, Prof. T. MABRY, Prof. G. OURISSON (Titular Members).

1. Minutes of the Last Meeting

The minutes of the meeting held in Hornbaek (11-12 June 1970) were agreed to be a true and accurate record. The Chairman also drew attention of Members to the *Report of Activities: 1970* published in *Information Bulletin* No. 40 (June 1971).

2. Symposium on Chemistry in Evolution and Systematics

The Chairman said that the proposal to hold the Symposium in 1971 had proved impossible due to clashes with other IUPAC meetings. However, it had been agreed in correspondence that the Symposium should be held at Université Louis Pasteur Strasbourg during 3-8 July 1972. The Executive Committee had decided that IUPAC should sponsor the Symposium and had granted a subvention of \$2,000 towards expenses. The Symposium Committee (KJAER, HARBORNE, SWAIN) had been augmented by three local members (Prof. G. OURISSON, Prof. C. MATHIS, and Dr. R. WOLFF), and had taken a number of provisional steps such as the booking of lecture theatres and of accommodation in student hostels and had prepared a first circular. There would be ten plenary lectures together with short contributed papers.

It was suggested that there should be two general plenary lectures, one dealing with the advantages of using chemical data in systematic problems and the other with the origin of life. These might well form the opening and closing lectures of the Symposium. In order to ensure adequate discussion of the plenary lectures given in each session, each plenary lecturer should be asked to put forward names of three or four other leaders in his particular field who could be invited to act as discussion leaders. Their role, as 'discussants', would also be to present short auxillary papers following the main contribution. Alternatively, their own views might be covered by the plenary lecturer. Funds should be sufficient to pay their subsistence in Strasbourg.

It was noted that the Executive Committee of IUPAC had agreed sponsorship on the condition that the "specially invited lectures will be published in *Pure and Applied Chemistry*". This condition would be brought to the notice of all speakers producing manuscripts. Some plenary lecturers, however, might decline to speak if it was insisted they had to produce a written version. In such cases it was felt that publication should not be mandatory, but the views of the Division President should be sought on this question. In any event, plenary lecturers should be asked to provide a 1-2 page summary of their paper for the Symposium Handbook in which abstracts of contributed papers, including those by discussants, might also be printed depending on the numbers involved. The contributed papers should be selected on the basis of relevance and, if too many were received, some might be read in title only rather than running several parallel sessions. It was recognized that young scientists should be encouraged to give papers and the Symposium Committee should take this into account in planning the final programme.

In further discussion it was agreed that, in accordance with precedence, no member of the Symposium Committee should be a plenary lecturer. The

ten proposed lecturers were: Prof. V. HEYWOOD (University of Reading, UK) to give the opening lecture on Chemosystematics—Its Roll and Future; Prof. D. JANSEN (University of Chicago, USA) to give the plenary lecture in the section on Insect-Plant Coevolution; Prof. T. MABRY (University of Texas, USA), Chemistry of Evolutionary Races; Prof. H. GRIEBACH (University of Freiburg, Germany) and Dr. J. B. BU'LOCK (University of Manchester, UK), Comparative Aspects of Biosynthesis; Prof. D. BOULTER (University of Durham, UK) and Prof. C. LAIRD (University of Washington, USA), Molecular Evolution; Dr. G. EGLINTON (University of Bristol, UK) and Dr. G. O. BLUMER (Woods Hole Oceanographic Institution, USA), Fossil Chemistry; and Prof. S. FOX (University of Miami, USA). Although only three countries were represented, other suggested names from Eastern Europe, Asia, and elsewhere did not appear to be as suitable as those chosen. It was hoped, however, that a wider geographical distribution would appear among the invited discussants.

With regard to finance, it was agreed that the registration fee would be of the order of \$25 and that extra financial support be actively sought from industry and other organizations approved by the French IUPAC National Committee.

3. Other Meetings on Chemosystematics

The Chairman informed the Commission that the International Symposium to be held in Bulgaria in October 1971 would not be sponsored by IUPAC. The organizers of the VIIIth International Symposium on Chemistry of Natural Products (New Delhi, 1972) had been kept informed of the Commission's own plans for a Symposium. The Commission's attention had also been drawn to the proposed Symposium on Plant Biochemistry, to be supported jointly by IUB and IUBS and planned to be held in Leeds in the summer of 1972. The organizers had already been appraised of the Commission's plans and had tentatively agreed to organize the meeting in the week following the Strasbourg Symposium. The planning committee for the IUB-IUBS meeting would have a Commission Member. A number of other meetings of interest to the Commission were listed in *Chemical Plant Taxonomy Newsletter* No. 16 (June 1971).

4. Publications

- (i) *Chemical Plant Taxonomy Newsletter*. The Chairman said that the President of the Organic Chemistry Division had agreed, in principle, to an allocation of funds to support the Newsletter subject to the proviso that "the Division Contingency Fund remains adequate to bear the charge". The two editors had stated that the cost of producing two issues each year of the Newsletter, which had a circulation of approximately 500, was about \$250 including mailing to recipients, many of whom did not pay the modest (\$1.50) handling charges requested. While it might prove possible in future to obtain industrial support (as with *Pharmacognosy Titles*), it would be useful if the Division could agree to support the project for the next two years to ensure its viability.

In discussion, it was pointed out that the Section on Medicinal Chemistry (III.4) had for two years issued a Newsletter twice a year which was entirely supported by industry. The IUPAC *High Temperature Bibliography*, published quarterly, was produced until April 1970 for the Commission on High Temperatures and Refractories (II.3) of the Inorganic Chemistry Division, by the US National Bureau of Standards. In 1970 the publication was given a once only grant of \$360 by the

Inorganic Chemistry Division to enable it to continue until self supporting by subscription. This might be a suitable way of helping the *Chemical Plant Taxonomy Newsletter*. The editors should be asked to seek help from industry and to charge subscribers so that the publication was self supporting by 1973.

- (ii) *Other Publications*. The Chairman drew attention to various documents which had been circulated regarding the future of *Chemotaxonomie der Pflanzen*, the *Kariyone Index*, *Pharmacognosy Titles*, and the *Scott-Devon Index*. With regard to the first named publication, Vol. 6 would treat the Rafflesiaceae to Zygophyllaceae and should be completed by December 1971. The final volume will include Leguminosae, a general index, and additional references to new developments and was in active preparation. Revision of earlier volumes of the series was an urgent requirement but Prof. HEGNAUER thought that this could best be done by updating and improving Kariyone's Index and by starting a new publication on *Recent Advances in Chemotaxonomy*. It might be useful to combine the best efforts of those responsible for Kariyone, the parts of *Excerpta Botanica* dealing with chemotaxonomy and, perhaps, *Berichte der gesamten Biologie* published by Springer Verlag. All these publications were commercial and the Commission could do no more than suggest collaboration between them. Even if the proposed combined venture was taken over by IAPT (in *Regnum Vegetabile*), the Commission would not wish to act as more than a catalyst to bring the various interests together.

Dr. NATORI had reported that the *Kariyone Index* completed up to 1965 would be out by the end of 1971 and abstracting for the 1966-8 issues was almost completed. It was hoped that the series would be more or less up to date by the end of 1972.

Pharmacognosy Titles was proving to be a very valuable publication. The literature surveyed was reasonably comprehensive and the *Annual Index of Plant Taxa* which was now being produced, was extremely useful. The editor, Prof. FARNSWORTH, had reported that the support of the Commission had been useful in obtaining financial backing.

The first of three volumes of the *Scott-Devon Index of Natural Products*, which dealt with about 3,500 known terpenoid compounds, was being published by Academic Press in 1971. The literature would be covered until December 1970. The other two volumes, covering alkaloids and related compounds and polyketides, were ready for the press but publication would be held up until reception of the first volume was known. Uptodate annual volumes were in active preparation. Examples of the format had been sent to Members of the Commission and the data included for each compound of known structure, its trivial name, empirical formula, molecular weight, rotation, m.p., and one key reference to structure determination. No attempt was being made to list references to all known sources of any given compound. Prof. SCOTT (Yale University) had told the Secretary that continued support by the Commission would be valuable and it would be useful if Members could draw attention to reasonably comprehensive private collections of references on selected groups of compound, and suggest ways in which botanical references might be included.

In discussion, it was agreed that the Commission should continue to give its support to FARNSWORTH, HEGNAUER, and NATORI. The Commission should also try to encourage more collaborative efforts in the

preparation of annual reports on phytochemistry. With regard to the *Scott-Devon Index*, the Commission would certainly advertise the needs of the organizers with regard to any comprehensive indexes which might be available. The need for a botanical index for the publication was clear and it was suggested that Dr. J. MEARS (Philadelphia Academy of Arts and Sciences) might be able to help in its preparation. His name could be put forward to Prof. SCOTT. In a similar way, it might be useful if Prof. FARNSWORTH was asked to consider whether a chemical index could be prepared for *Pharmacognosy Titles*. This might be based on the *Scott-Devon Index*.

- (iii) *Phytochemical Reports*. The Chairman said that the Organic Division Committee had discussed the problem of ensuring that claims made in short communications were backed up with sufficient experimental evidence. In some cases also, such evidence might be interpreted in a different way from that of the author. It had been suggested that these difficulties might be overcome by refusing to accept short notes unless the evidence on which claims were based was submitted at the same time to editors and referees for scrutiny, but not for publication.

In discussion it was pointed out that in reporting the occurrence of known compounds from new plant sources, the tendency had been the reverse of that outlined by the Chairman. Authors had been asked to reduce papers to a minimum by deleting all supporting evidence such as infrared or NMR curves. Indeed, discussion had been proceeding as to whether the findings in such reports might not be tabulated and *all* supporting data left unpublished, but placed in suitable archives. Such a course seemed to be acceptable, since no new types of compound, new reaction or new theoretical principle were being reported. However, editors should be strongly encouraged to apply more strictly the Commission's prepared note on the *Documentation of Plant Materials* (*Information Bulletin* No. 40, June 1971, p. 70).

- (iv) *Biochemical Systematics*. The Secretary reported that the problems which Prof. MABRY had brought up at the last meeting had been discussed with a wide spectrum of biologists interested in chemosystematics. As a result, it had been agreed that there was a need for a new journal dealing with aspects of chemical and biochemical systematics from a more biological standpoint. Agreement had been reached with Prof. E. SCHOFFENIELS (Liège) and with Pergamon Press to start a new journal called *Biochemical Systematics* in 1972.

5. Relationship of Commission with Other Bodies

The Chairman of the IUPAC-IAPT Joint Committee (Prof. W. F. GRANT) said it had been generally agreed that the great problem in establishing international collaboration in chemosystematics was to ensure that there was a free exchange of ideas between biologists, chemists, and biochemists. The main research effort, at present, was in studies of the distribution of secondary chemical compounds in plants, and this was reflected in the composition of the present Joint Committee. There appeared to be no international organizations comparable with IUPAC and IAPT which dealt with animal and microbiological applications. Before any broadly based International Organization for Chemosystematics was established, therefore, it would seem necessary to set up a Commission which took into consideration these deficiencies and had the backing of IUB, IUBS, as well as IUPAC. The views of all these international organizations on the matter needed to be

explored and the Joint Committee sought approval for carrying out such an investigation. In addition, the Joint Committee felt that it should meet, preferably in Austin, Texas, since this would be the least costly venue, in the spring of 1972, so that a report could be prepared on the problems involved for consideration by the Commission in July 1972. It would be helpful for these collaborative efforts, if the three IAPT Members were appointed as Associate Members of the Commission.

In discussion it was stressed that there would be little use in establishing yet another official international organization for its own sake. Unless there was a definitive problem which could only be solved by setting up such a body, it would be better to seek other ways to ensure the continued growth of chemosystematics. For example, an international organization might be established whose members paid annual dues as in most national scientific societies. The International Organization of Plant Biosystematists (IOPB) was of this type; it obtained some money from the subscriptions paid to the parent organization IAPT, and had organized several international symposia with grants from IUBS and other sources. There was an urgent need to settle the whole problem since it was likely that the Commission would complete all that was possible of the tasks it had set itself by the next IUPAC Congress in 1973. It would be unwise to assume that IUPAC would wish to give full support much longer than then.

It might be argued that it was important to support chemotaxonomy because of its multidisciplinary nature. However, there were many other new fields where similar arguments could be put forward. On the other hand, the incoming President of IUPAC in a note published on *Interdisciplinary Matters* in *Information Bulletin* No. 39 (February 1971) had said *inter alia* that "IUPAC should exercise more initiative in encouraging and promoting new developments in all aspects of chemistry and closely related subjects, making maximum use of existing IUPAC bodies to do this". The continuing problem of bringing chemists and biologists together at the highest level could perhaps only be overcome under the auspices of an accepted international organization or by several acting jointly. The proposal of the IUPAC-IAPT Joint Committee to investigate the ways and means of accomplishing this seemed to be a reasonable starting point, providing it was clearly understood that IUB and IUBS must join in any future organization. If, as a result of this investigation, the Joint Committee could formulate definite proposals on the question and the others raised in discussion, there would be a good deal to recommend a meeting in Austin, Texas. The Joint Committee should be informed that earlier approaches to IUB, IUBS, and to several individual scientists had shown that it would be difficult to form links with interested animal and microbiological systematists and with biochemists.

6. Information Storage and Retrieval Systems

The Secretary drew attention to correspondence on this matter which had been circulated to the Commission, with the Institute of Scientific Information (Philadelphia, USA), Information Retrieval Ltd. (London, UK), Chemical Abstracts Service (USA), and the UK Chemical Information Service. There appeared to be a continuing need to keep in touch with such organizations without, of course, involving the Commission directly.

7. Nomenclature

The Chairman pointed out that the question of trivial names for new compounds had been brought up at the last meeting of the Commission. He had

approached the Commission on Nomenclature of Organic Chemistry (III.1) through the Division Committee and the draft report of Commission III.1 on this question had been circulated to Members. The sub-committee under Commission III.1, dealing specifically with these problems, had asked for help, where required, in formulation of rules for the naming of basic skeletons in several groups of naturally occurring compound. Members of the Commission might like either to aid the project themselves or to suggest other scientists who could help.

8. Other Business

The Chairman said that in view of the Commission's widening interests, it had been suggested by the Division Committee that there would be an advantage in dropping specific reference to plants and that the Commission should be named simply "Commission on Chemical Taxonomy". This seemed to be an eminently sensible suggestion. The Commission should also give thought to future meetings. The next IUPAC Congress would be held in Hamburg in September 1973. Members might, however, like to take advantage of the Strasbourg Symposium and meet there in July 1972, especially if the Joint IUPAC-IAPT Committee was allowed to meet in the spring of 1972 to prepare its Report to the Commission.

AD HOC COMMITTEE FOR INTERNATIONAL ORGANIZATION OF CHEMOSYSTEMATICS

17-18 July 1971

Present: Prof. W. F. GRANT (Chairman, IAPT), Dr. T. SWAIN (Secretary, IUPAC), Dr. J. B. HARBORNE (IUPAC), Prof. T. MABRY (IUPAC).

I. International Organization of Chemosystematics

The Chairman said that the Committee had been charged with examining ways of establishing an International Organization of Chemosystematics (IOC) and reporting back to the parent organizations (IUPAC and IAPT) in one year. Prof. LÖVE had originally suggested that the proposed IOC be set up under the auspices of IAPT, in a similar manner to the International Organization of Plant Biosystematists (IOPB). This would have the advantage of not requiring the establishment of any *de novo* organization since IAPT had a comprehensive address list, collected subscriptions, and could obtain extra financial support from IUBS. Furthermore, IAPT ran the publications *Taxon* and *Regnum Vegetabile*, which could be used to publish news items and serious articles or collections of data of chemotaxonomic interest. It was envisaged that any member of IAPT could become a member of IOC as desired without extra subscription.

In discussion, it was suggested that while an organization under IAPT would be excellent to cater for botanists interested in the application of chemistry to systematic problems, it might attract too few chemists and even fewer zoologists, microbiologists, and biochemists to be of real value. Although it was recognized that the main strength in chemosystematics lay in its application in the plant kingdom, it was essential to attempt to bring other disciplines into any future formal organization. Furthermore, it seemed possible that IAPT might not be able to sustain financially another daughter organization without increasing the overall subscription. Although this might be in the nature of a surcharge to those interested in IOC, it seemed proper to examine the whole question of finance with IAPT. Bearing in mind some of the drawbacks outlined, it might be better to start IOC through those who subscribed to the *Chemical Plant Taxonomy Newsletter*. It seemed possible that the Newsletter might expand its coverage from plants, especially if some IUPAC support was forthcoming for the next two years as had been proposed by its Commission on Chemical Plant Taxonomy. The expanded membership would include zoologists, microbiologists, and biochemists and could then act as a nucleus for IOC, each subscriber paying a determined sum for Newsletter and membership. An organization so based could still attract support from IAPT and IUPAC and financial help from the appropriate international union to assist in the support of symposia.

2. International Executive Committee

The Chairman said that, regardless of the way in which IOC was to be established, it was necessary to consider whether an Executive Committee should be set up to run the organization, and if so, whether it should be attached to an international organization such as IUPAC or IUBS. Furthermore, it would be useful to examine whether such a Committee might continue some of the work of the present IUPAC Commission on Chemical Plant Taxonomy if and when that body ceased to function. It seemed likely in view of earlier discussion that any future organization should be more broadly

based than the present IUPAC Commission which quite naturally emphasized the chemical side in its approach to chemosystematic studies, including the programme of the Strasbourg Symposium (1972). It was obvious there was still a need to bridge the gap between chemists and botanists and, even more, other biological systematists. The need to bring in zoologists and microbiologists as well as biochemists precluded having an organization wholly under IUPAC or IAPT. The views of other organizations, IUB and IUBS, must be sought on this question although earlier approaches had not met with success.

In discussion, it was suggested that IOC might not require an International Executive Committee, and it would be futile to establish such an organization unless there were defined needs. Nevertheless, it would be useful to explore whether there were advantages in establishing such a body. For example, it might be the only way to bring in the systematists in fields other than botany, or to obtain financial support for possible future symposia. This Committee should seek the views of IUBS and IUB on the matter and, perhaps, clarify the position of IUPAC and IAPT, with a view to the desirability of forming a Joint Committee between interested international organizations.

3. Other Business

The Chairman drew attention to a brief statement which had been prepared for publicity purposes. In view of the discussion on previous items, it seemed best to modify the statement before it was distributed to various interested journals. A brief interim report on the previous discussions had also been prepared and would be submitted to both parent organizations. In order to prepare a final report in one year's time, it would be desirable for the Committee to meet in the spring of 1972 when the results of the various investigations which were being undertaken were known. Since four of the Members were in North America, it would be most economical to meet there and, if Austin, Texas, was agreed as the location, the cost would be about \$1,400 of which \$1,000 would fall to IUPAC and the rest to IAPT.

SECTION ON MEDICINAL CHEMISTRY (III.4)

16–18 July 1971

Present: Prof. E. CAMPAIGNE (Chairman), Dr. A. I. RACHLIN (Secretary), Prof. A. ALBERT, Prof. E. J. ARIËNS, Dr. F. L. ROSE, Prof. P. SENSI, Prof. V. A. YAKOVLEV (Titular Members); Dr. L. G. HUMBER, Dr. M. PROTIVA, Dr. L. STERNBACH (Associate Members).

I. Finalization of Agenda

The first session began with a welcome by Prof. CAMPAIGNE, who then reviewed the accomplishments of the Section since the organizational meeting in February 1970. The proposed agenda was discussed and adopted.

2. Reports by Secretary

(i) *Minutes of Previous Meeting.* The minutes of the organizational meeting (Zürich, 13–15 February 1970) were accepted after a brief discussion of the duties and responsibilities inherent in Section Membership.

(ii) *Correspondents.* The list of Correspondents had been expanded on a truly global basis. Copies of the current organizational chart (Appendix I) were distributed. The concept of 'Correspondent' would continue as delineated in the constitution and continuing efforts would be made to expand into areas where the Section was not yet represented, *i.e.*, Austria, *etc.*

(iii) *Newsletter.* The Newsletter had proved to be very satisfactory. In order to increase circulation it was agreed to distribute several copies of each issue to those on the present mailing list, and to include a statement urging the reproduction and further distribution of pertinent portions. The Members were requested to send names of new interested recipients to the Secretary.

3. Reports of Committees

(i) *Committee on Symposia and Meetings.* Prof. ARIËNS reported that the wide geographical distribution of his Committee necessitated several unilateral decisions in the interest of speedy action. This situation could be alleviated only if more lead time was available for planning meetings. According to Dr. MORF, this would fit normal IUPAC procedure, *i.e.*, except for unusual circumstances (where timing was important, for example) two year's notice was required before IUPAC would accept sponsorship of meetings. Consequently, it should be possible to consult the Committee Members when future IUPAC sponsorship was sought.

Symposia were separated into three categories by Prof. ARIËNS: 1. Symposia initiated and sponsored by IUPAC at Congresses in odd-numbered years. 2. Symposia where little or no IUPAC financing was required—meetings which would be held in any event, but for which IUPAC cosponsorship was requested. 3. Meetings of interest to medicinal chemists in which the only Section involvement was a listing in its Newsletter. In the ensuing discussion it was agreed that high quality and genuine international character must be requirements for IUPAC support. This would be relatively easy to supervise in category 1. While more difficult in category 2, the two-year rule mentioned above would provide more time to evaluate the proposals and offer an opportunity to become involved in the planning. It was also agreed that sponsorship of such meetings should be limited to two or possibly three in any given year.

In response to the question of obtaining IUPAC financing for category 2 meetings the Section Officers reported on having learned at the meeting of the

Organic Chemistry Division that this was possible, but the budget for such ventures must be approved preferably two years in advance.

The Section Officers also reported on having been informed orally of IUPAC approval for the Milan meeting in September 1972. As a consequence, Prof. ARIËNS would give a negative reply to the Indian inquiry regarding sponsorship for a symposium at that time.

Despite the tardiness of the Section's approach, the organizers of the XXIVth IUPAC Congress (Hamburg, September 1973), had agreed to sponsor a half-day symposium on medicinal chemistry. It was the Section's responsibility to propose a programme by September 1971 and a committee (Prof. SCHULTE, Prof. MUTSCHLER, Dr. SEYDEL) working with Prof. ARIËNS had been charged with this responsibility. The Members of the Section decided unanimously on a format of 3 or 4 major lectures on a single, central theme. Three possible themes were selected and the Secretary was instructed to transmit this information to the committee without delay.

Prof. ALBERT suggested a IUPAC-sponsored symposium on pyrimidines in 1972 (despite the two-year requirement). This matter would be explored by Dr. RACHLIN who was scheduled to meet with Prof. D. J. BROWN (Australia) and Prof. E. C. TAYLOR (USA) in October 1971—Prof. ARIËNS would be appraised of any development.

The Committee's report was accepted and the Committee was requested to carry on its excellent work.

(ii) *Committee on Education of Medicinal Chemists*. Prof. CAMPAIGNE, acting for the Committee Chairman, Prof. SMISSMAN, reviewed the tentative report. He emphasized that the Committee was a fact-finding body and Prof. SMISSMAN would like some feedback from the Section. He sought more insight into the definition of a medicinal chemist and he wanted broader coverage, hopefully to include Committee representation for countries in addition to those now included (currently France, Germany, India, Italy, Japan, Netherlands, USA). There was an animated discussion which showed, among other things, that industry should be included in the survey. Prof. CAMPAIGNE would forward the various comments to Prof. SMISSMAN with a request that the Committee continue its excellent work and prepare a second, possibly final, report for the next meeting.

(iii) *Committee to Investigate "Bad" Patent Practices*. The Committee (Dr. ROSE and Dr. PROTIVA) studied the possibility that the chemical literature might be indexing compounds listed in patents but which in fact had never been made. In their opinion, such 'paper' examples did exist to a certain degree. Solace might be derived from the fact that *Chemical Abstracts* did not knowingly index nonexistent compounds—index entries were prepared from the original patent and included all compounds for which definite data was disclosed. To warrant entry, a compound must be new or have new information reported about it. It was concluded that the existence of 'paper' examples was deplorable but the Section could do very little about the situation other than to make the facts known. The Committee was requested to summarize the salient parts of the report in a few paragraphs for publication in the Newsletter. Dr. ROSE and Dr. PROTIVA were thanked for their work and the Committee would be dissolved on submission of the summary report.

4. Reports of Representatives

(i) *XXIIIrd WHO Assembly, Geneva, 5–22 May 1970*. Dr. MORF reported that the World Health Assembly was, as usual, a huge gathering featuring many speakers on diverse topics. However, the most important topics were

three alarming situations currently facing the world community: 1. cholera; 2. drug abuse which was on the increase; 3. the problem of drug dependency and side effects of drugs. After some discussion during which it was suggested that the Section might consider cholera and drug abuse as areas where it could make positive contributions, Dr. MORF's report was accepted with thanks.

(ii) *XXXth Congress of FIP, Geneva, 30 August–5 September 1970*. It was noted with regret that Prof. GAUTIER was unable to attend the meeting because of illness. He nevertheless submitted a full report which was translated by Dr. HUMBER who also reported on its salient features. The central theme of the Congress was the subject of hallucinogens. However, the most important development was the restructuring of FIP. A Board of Pharmaceutical Sciences was set up to coordinate the scientific activities. Several scientific subgroups, including one concerned with medicinal chemistry, had been set up. The Section's contact with FIP had been held in abeyance pending this reorganization. It should now approach the Secretary of the Board (Prof. POLDERMAN, Netherlands) about establishing a contact within the Correspondent context. The report was accepted with thanks.

(iii) *CIOMS, Geneva, 10–11 September 1970*. Prof. ARIËNS attended a round table conference on *Training of Research Workers in the Medicinal Sciences*. Most medical research workers had been drawn from the medical profession and in many cases they had, after completing their medical studies, obtained a practical training by working with a more advanced research worker—a kind of apprenticeship. The question of formalizing this training was discussed. It was recognized that the research workers should also have a background in the natural sciences but there was no general agreement on how best to incorporate the complete scientific background into a formal curriculum. The question was discussed from several points of view but no conclusions were reached. Prof. ARIËNS presented a summary report—a complete report of the proceedings was scheduled to be published.

(iv) *European Meeting on Medicinal Chemistry, Brussels, 14–17 September 1970*. Prof. ARIËNS reported on a discussion organized at the Brussels Meeting for the purpose of expanding the existing European Committee for Medicinal Chemistry into a truly regional group. The thought was to encourage the formation of medicinal chemistry groups in European countries where none now existed. These groups could organize in an autonomous fashion but would be encouraged to affiliate with the European Committee which would in turn serve as the first line of communication with the Medicinal Chemistry Section of IUPAC. In this way all information funneled into the European group would get global dissemination by IUPAC. Dr. J. THUILLIER (France) was asked to serve as the Chairman of the European committee-in-formation and Dr. A. SIMMONDS (UK) was asked to serve as Secretary—both accepted. Other members of the Executive Committee were Prof. P. PRATESI (Italy), Prof. J. GAUTIER (France), and Prof. K. E. SCHULTE (Germany). Prof. ARIËNS (Netherlands) was also working with the group. It was hoped that the expanded European group would serve as a model for similar regional groups in other parts of the world.

(v) *Symposium on Antibiotics, St. Marguerite, Quebec, 1–3 March 1971*. Dr. RACHLIN confined his remarks to describing some of the peripheral features of the Symposium because a complete report, written by Dr. S. RAKHIT (organizer and secretary of the symposium), had already appeared in *Information Bulletin* No. 40 (June 1971, pages 78–81).

5. Problems Referred by IUPAC

(i) *The Environment*. Attention was directed to a letter from the IUPAC Executive Secretary requesting pertinent material for inclusion in a document on environmental sciences being prepared by the Executive Secretary of ICSU. The letter was received too late to contact Members prior to the deadline. Accompanying the letter was information concerning the activities of the ICSU Special Committee on Problems of the Environment (SCOPE) which was created in 1969. Dr. MORF pointed out that IUPAC, through the Section on Industrial Hygiene and Toxicology (VI.4) had been interested in environmental problems for 15 years and had indeed held three international symposia on the subject. He raised the question of duplication of effort and urged that this Section should support the continued activity of Section VI.4 in this area. In order to obtain more information about SCOPE, it was decided to request permission to have Prof. ALBERT attend the next meeting of SCOPE (Canberra, 30 August 1971) as an observer.

(ii) *WHO-Mass Health Examination as a Public Health Tool*. The WHO title report was referred to the Section for comment by 15 December 1970. It was received too late for circulation to Members but an appropriate reply was made by Prof. CAMPAIGNE to Dr. CANDAU of WHO. The matter was discussed briefly and it was decided that this matter was more appropriate for the Clinical Chemistry Section. No further action was recommended by the Section.

6. Problems Referred by Members

(i) *International Screening for Drugs*. Prof. YAKOVLEV raised the question of whether it would be feasible to set up an international total screening programme with complete exchange of the resulting biological data—including negative results. After considerable discussion it was concluded that the idea was excellent but implementation would not be practical. Even in a relatively small operation, computer techniques were required and translation to a global basis with the necessary coordination of the diverse testing methods would be an impossible task. It was doubted that industry would cooperate. More positively, it was suggested that a round table discussion of current approaches to drug studies, similar to those which had been held nationally—but never internationally, would be useful. Prof. ARIËNS was requested to add this topic to his list of subjects to be included in future symposia.

(ii) *Contacts Among People Engaged in Liaison Work*. Dr. HUMBER called attention to the people engaged in arranging a variety of international collaborative efforts in the areas of drug research and development. These individuals, many of whom were medicinal chemists, contributed to the transfer of information on drugs and the question was raised as to whether the Section could cooperate with them by (a) compiling an international register of such representatives (the Correspondent from the Chemical Institute of Canada, Dr. M. A. DAVIS, volunteered to undertake this task if so authorized) and/or (b) setting up a specific programme within the framework of an IUPAC-sponsored medicinal chemistry meeting dealing with the problems encountered by these people. The consensus was that the proposal appeared to be more commercial than scientific and was, therefore, inappropriate for sponsorship by an IUPAC body. Dr. HUMBER was encouraged to convey this attitude to Dr. DAVIS and, if further clarification could be made, the Section would be willing to discuss the matter again.

(iii) *International Society of Heterocyclic Chemists*. The International Society of Heterocyclic Chemists had been invited to affiliate with IUPAC as an Associated Organization. Prof. CAMPAIGNE read pertinent correspondence between Prof. BARTON and Prof. CASTLE of the Society and also drew attention to a statement in Prof. BARTON's 1970 Report to the Bureau (*Information Bulletin* No. 39, February 1971, p. 14) where this situation was mentioned as being a problem for the Section. The latter fully subscribed to the IUPAC position that the heterocyclic chemists, as an International Society, should be part of IUPAC but it did not accept this as a Section problem—it was one which should be handled by the Organic Chemistry Division. However, the Section would continue to exert whatever influence it could to promote the liaison with IUPAC.

(iv) *Nomenclature of Nonproprietary Drugs*. A WHO pamphlet produced by Dr. O. WALLEN about three times per year, listed proposed international names for pharmaceutical drugs. Prof. ALBERT reported that frequently incorrect chemical nomenclature were used in these pamphlets and suggested that the Section should try to correct this failing. Prof. CAMPAIGNE and Dr. RACHLIN mentioned this problem at the Organic Chemistry Division meeting and were advised to have Dr. WALLEN submit his list to the Commission on Nomenclature of Organic Chemistry for checking prior to publication. Dr. WALLEN was scheduled to attend the FIP meeting (Washington, September 1971) and Prof. CAMPAIGNE would attempt to arrange a meeting on this matter. The discussion disclosed that incorrect nonproprietary names also appeared frequently in the literature. The Secretary was instructed to send a circular letter to all the Section's contacts with existing medicinal chemistry groups, drawing attention to this state of affairs and urging their members to exercise extreme care to use WHO-approved names for nonproprietary drugs in their publications. The letter would be written after Prof. CAMPAIGNE had met with Dr. WALLEN.

(v) *WHO Chronicle*. Prof. ALBERT mentioned that the *WHO Chronicle*, an annual publication, drew attention to those diseases which were considered to be the most serious in the world. He suggested that the Section's Members should be alerted to these facts and the information should be publicized in the Newsletter. The suggestion was adopted and Prof. ALBERT agreed to abstract the relevant material from future issues of the *WHO Chronicle* for direct inclusion in the Newsletter.

(vi) *Sources of Information Available to Medicinal Chemists*. Dr. HUMBER raised the point that information on new drugs was frequently not readily available to medicinal chemists primarily because there were sources of information other than the usual literature. The problem was compounded because it varied from country to country. The Members had no thoughts on how to cope with this situation so Dr. HUMBER was asked to investigate the matter and report back at the next meeting.

(vii) *Medicinal Chemistry Award*. The question of an international award for medicinal chemists was discussed. Such awards were made by national groups but no one was aware of any international equivalent. Dr. HUMBER, who initiated the discussion, suggested that information be gathered for consideration at a future meeting when, if warranted, positive action could be taken. The Secretary was instructed to contact the ACS Medicinal Chemistry Division for details of its award. He would also request full information on awards from all of the Section's contacts with other medicinal chemistry groups and report his findings at the next meeting.

7. Nominations for Membership

The Titular Members met in closed session to nominate Section Membership effective (if approved) at the conclusion of the XXVIth IUPAC Conference.

The following guidelines were adopted: (i) the permitted 8 Titular Members would be completed by one four-year nomination (1971–1975) to start the planned overlap with the terms of the existing 7 Titular Members whose first four-year terms ended in 1973; (ii) since Associate Members did not have definite appointments, the current Associate Membership list would be terminated to be replaced by a new group drawn from possible holdovers and new nominees. Seventeen names were submitted by the Correspondents and, after careful consideration, the following nominations were made:

Titular Members

Prof. A. ALBERT (Australia)¹
Prof. E. J. ARIËNS (Netherlands)¹
Prof. E. CAMPAIGNE, Chairman (USA)¹
Dr. M. PROTIVA (Czechoslovakia)²
Dr. A. I. RACHLIN, Secretary (USA)¹
Dr. F. L. ROSE (UK)¹
Prof. P. SENSI (Italy)¹
Prof. V. A. YAKOVLEV (USSR)¹

Associate Members

Dr. N. ANAND (India)³
Prof. Y. BAN (Japan)³
Dr. J. F. CAVALLA (UK)³
Dr. L. G. HUMBER (Canada)⁴
Prof. E. MUTSCHLER (Germany)³
Dr. J. THUILLIER (France)³

¹Term 1969–1973; ²Term 1971–1975; ³Term 1971–; ⁴Term 1969–.

Prof. YAKOVLEV was requested to make a nomination from USSR for consideration as an Associate Member and possible eventual promotion to Titular Member. The eighth Associate Member position would be filled only if an outstanding candidate was found.

Prof. CAMPAIGNE reminded the Titular Members that in 1972 they must select a Chairman-elect, who would succeed to the Chairmanship in 1973, and a Secretary who would take office in 1973. Under the Section rules adopted in Zürich, the Chairman could not continue but the Secretary could stand for a second term.

8. Budget

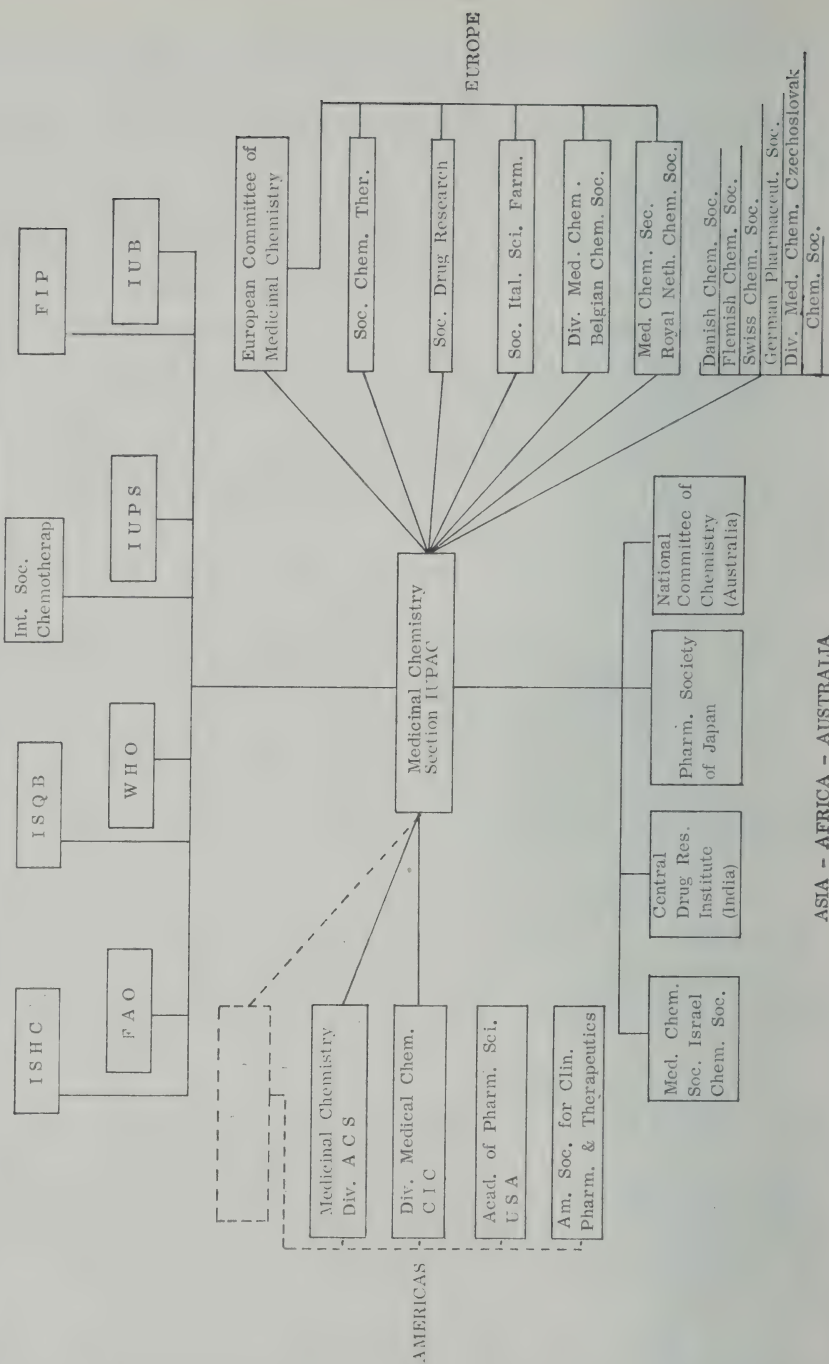
The budget was not discussed. It was agreed that the budget for 1972 and 1973 would be prepared by the Officers (Prof. CAMPAIGNE and Dr. RACHLIN). This was done and submitted to Prof. KJAER, Secretary of the Organic Chemistry Division, before the last meeting of the Division Committee.

9. Next Meeting

It was voted to have the next Section meeting coincide with the symposium being arranged by Prof. PRATESI under the auspices of Società Italiana di Scienze Farmaceutiche in Milan during September 1972. Since the 1st IUPAC Conference on Physical Organic Chemistry would be held in Crans-sur-Sierre, Switzerland, during 4–8 September 1972, Prof. ARIËNS would ask Prof. PRATESI to make every effort to arrange the Milan symposium for the following week (10–16 September 1972).

10. XXVIIth IUPAC Congress

The regular Conference-year meeting would be held in Germany, provisionally from 23 August to 2 September 1973.



MACROMOLECULAR DIVISION COMMITTEE

15 July 1971

Present: Prof. H. BENOIT (Vice-President), Prof. G. SMETS (Secretary), Dr. J. W. BARRETT, Prof. C. E. H. BAWN, Dr. P. COSSEE, Prof. O. HORN, Prof. S. OKAMURA, Prof. C. G. OVERBERGER, Prof. G. V. SCHULZ (Titular Members); Dr. R. W. CAIRNS, Dr. G. M. KLINE, Sir HARRY MELVILLE (Associate Members); Prof. W. J. BAILEY, Prof. Y. IWAKURA, Prof. B. RÅNBY, Dr. J. DE VRIES (National Representatives); Prof. H. A. SCHERAGA (Representative of IUPAB); Prof. K. A. WOLF (Representative of IUPAP).

1. A telegram was sent to Prof. WICHTERLE, President of the Division, expressing the regrets of all Members for his inability to attend the meeting. Prof. BENOIT (Vice-President) acted as Chairman.

The Division Committee recorded with regret the deaths of two of its Members, Profs. S. S. MEDVEDEV and V. KARGIN.

2. Election of New Division Officers

Since Prof. WICHTERLE was at the end of his Presidency, the Vice-President, Prof. H. BENOIT, was elected as the new President of the Division for the period 1971–75. Prof. C. G. OVERBERGER was elected as Vice-President, and Prof. G. SMETS was reelected for a second period as Secretary of the Division.

3. Election of Division Committee Members

As a consequence of a previous invitation to all Members to nominate candidates for Membership, a list with all proposals (about 50 names) was made up and distributed to all attendants at the beginning of the discussion. The Chairman emphasized that one should take into account a balance between academic and industrial people, between the various disciplines (physics, chemistry, and biopolymers), and also the geographical distribution. This problem had been considered in a meeting of the Division Officers in Prague on 24 June 1971 and finalized in a proposal which was presented to the Members.

After election of the new Division Officers, the following other (Titular) Members were replaced: Prof. BAWN, Prof. OKAMURA, and Prof. SCHULZ, and one vacancy had to be filled to bring the (Titular) Membership to twelve. Since Prof. HORN had been nominated as a candidate for the Office of Treasurer of the Union, and considering the incompatibility of that position with Membership of a Division Committee, it was proposed to vote for a fifth name which would only be confirmed after the election for IUPAC Treasurer. The Members were invited to vote for five names. The results were the following: Prof. Y. IWAKURA (Japan), Prof. E. W. FISCHER (Germany), Prof. D. W. SAUNDERS (UK), Dr. J. DE VRIES (France), elected as (Titular Members). Dr. R. F. BOYER (USA) was proposed for eventual succession to Prof. HORN.

It was decided to replace the following four (Associate) Members: Dr. A. M. BUECHE, Prof. M. LETORT, Prof. G. NATTA, Prof. I. SAKURADA, and to add one extra person to bring this category of Membership to eight. The following new Members were coopted: Dr. H. CHERDRON (Germany), Dr. J. D. HOFFMAN (USA), Prof. S. OKAMURA (Japan), Dr. H. EISENBERG (Israel), Prof. A. J. STAVERMAN (Netherlands). If Dr. CAIRNS was elected Vice-President of the Union, he would be replaced on the Division Committee by Dr. C. E. HOLLIS (UK).

4. Activities of the Division

(i) *Working Party on Relationship of Performance Characteristics to Basic Parameters of Polymers.* A sub-committee headed by Dr. BARRETT, Dr. DE VRIES, and Prof. BENOIT had organized a working meeting on *Relaxation Phenomena and Mechanical Properties of PVC* in Strasbourg, 5–6 March 1970. There were about 50 attendants. Two of the papers which were presented would be published in the near future. The great importance of such small meetings in which industrial and academic scientists could freely exchange their experimental findings was appreciated by all attendants. Up to the summer of 1971 nineteen meetings of this working party had been held dealing with the structural parameters of polymers, which were examined in parallel by the group headed by Prof. BENOIT.

Dr. BARRETT who had led this group from its very beginning, resigned from that position at the end of 1970. Following his recommendation, he was replaced by Dr. DE VRIES. The Division Committee, which acknowledged the importance and successful results of this group, decided that the status of a regular IUPAC Commission was more appropriate for its work.

Therefore, the Division Committee recommended the creation of a new Commission, entitled *Structure and Mechanical Properties of Commercial Polymers*, for which a Membership was suggested.

(ii) *Molecular Characterization of Polymers.* In 1969 it was decided to study commercial standard samples of polymers in order to see if the same technique used in different laboratories led to the same results and to find precise methods for characterization of molecular parameters, such as degree of branching, degree of stereoregularity, *etc.* Eighty-five laboratories took part in this action organized by Prof. BENOIT. As a result, a summarizing report was prepared showing great discrepancies in determinations of molecular weight of some polymers. Since the disagreement in results was especially pronounced for low and high pressure polyethylene, all laboratories involved sent their representatives in March 1971 to Strasbourg where a research programme was established to elucidate and solve these difficulties. The probabilities of errors were established and it was expected that a relatively few supplementary measurements would distinctly improve the situation. This action would continue and since there were many other problems of the same importance which could be solved only by international cooperation, the creation in the near future of a Commission for Molecular Characterization of Polymers had been recommended to the Bureau.

(iii) *Teaching and Research in Macromolecular Science.* Further information had been collected about education at the postgraduate level in the polymer field in relation to education in other branches of chemistry. A striking disproportion for most countries, except Japan, was found between the representation of macromolecular science in teaching and research activities in academic and national research centres (only 5–7% of all Ph.D.'s were devoted to polymer science) on the one hand, and the enormous expansion of polymer chemistry and technology (40–50% of scientists educated in these centres were working in the polymer field) on the other.

In order to give the widest publicity to this information, it was decided that Prof. SMETS should write a short final summary of the report and send it to all Members of the Division Committee, including National Representatives, asking them to have it published in the relevant scientific journals.

(iv) *Commission on Macromolecular Nomenclature.* Dr. SUHR (Germany) and Prof. KORSHAK (USSR) had resigned as Titular Members of the Commission in 1971. Prof. N. A. PLATÉ (USSR) and Dr. W. RING (Germany) had been

appointed in their place. At its meeting at Ravello, July 1970, the Nomenclature Commission had continued discussions on stereochemical nomenclature of polymers, on nomenclature of linear polymers, and considered a number of recommendations on definitions, abbreviations, *etc.*, coming from ISO and from *Chemical Abstracts*. The Commission had finished work on two projects and tentative recommendations had been published as Appendices to the *Information Bulletin* (February 1971, Nos. 12 and 13). One dealt with definitions in the macromolecular field, the other was a list of abbreviations for synthetic polymers and polymer materials. Other projects of the Commission at this time concerned the development of a systematic nomenclature for polymers based on the structural repeating unit and stereochemical problems in the macromolecular field.

In order to avoid duplication of efforts in this domain, a broad exchange of documents with the Nomenclature Commission of the Organic Chemistry Division as well as with that of IUPAB was essential.

(v) *Macro Symposia*. Regular Symposia on Macromolecules sponsored by IUPAC were organized in September 1969 in Budapest (more than 1,000 active attendants) and in August 1970 in Leiden (around 700 active participants). In agreement with the general policy of the Division, the topics were restricted even in these general meetings: the Budapest Symposium was rather concentrated on chemistry and the Leiden Symposium on physics.

After the Symposium during the XXIIIrd IUPAC Congress in Boston (July 1971), the next macro symposia would be organized in Helsinki (July 1972) and in Aberdeen (September 1973). Some details about the Helsinki meeting were given by Prof. BENOIT and about the Aberdeen meeting by Prof. BAWN. Since the Aberdeen meeting would follow immediately after the XXIVth IUPAC Congress (Hamburg) where a polymer symposium was also planned, the Division Committee recommended to the organizers of the two meetings to collaborate over the scientific programmes in order to avoid duplication.

A request was introduced by Prof. A. G. ALVAREZ of Consejo Superior de Investigaciones Científicas, concerning the organization of a Macro Symposium in Madrid in the first half of June or the second half of September of 1974. The Division Committee decided to recommend sponsorship to the Bureau, if the topics were more severely restricted than in the original letter. Mention had been made of the possibility of holding the XXVth IUPAC Congress in Israel in 1975 and in Tokyo in 1977, where it was foreseen also to hold simultaneously a high polymer congress.

(vi) *Micro Symposia*. Besides the traditional general meetings stimulated and sponsored by IUPAC through the Division, there had been organized some smaller meetings strictly limited in their scope, the so called 'Microsymposia on Macromolecules' in Prague. The topics of these smaller meetings were as follows: Rheology of Polymer Solids (September 1969), Cyclopolymers and Cyclopolymerization (September 1969), Light Scattering in Polymer Science (September 1969), Polyvinylchloride: Its Formation and Properties (September 1970). A conference on Chemical Transformation of Polymers was held in Bratislava in June 1971.

A Gordon-type discussion meeting on Models of Biopolymer Structure and Functions was held in September 1970 in Marienbad under the joint sponsorship of IUPAC and IUPAB.

Further Micro Symposia had already been approved by the Division: Morphology of Polymers (August 1971, Prague), Thermodynamics of Inter-

actions in Polymer Solutions (September 1971, Prague), and Photochemical Processes in Polymer Solutions (June 1972, Louvain).

The Division Committee recommended that IUPAC sponsorship be granted to the following Micro Symposia:

- Xth Prague Microsymposium on "Conformational Structure of Polymers", 28–31 August 1972
- XIth Prague Microsymposium on "Mechanism of Inhibition Processes in Polymers: Oxidative and Photochemical Degradation", 4–7 September 1972.

A request from Prof. E. MANO (University of Rio de Janeiro) supported by the Academy of Sciences of Brazil was introduced to organize a meeting for 26–31 July 1974. This demand was received favourably. Following the general policy of the Division, a definite recommendation on sponsorship would be given as soon as more details were available on the programme and size of the meeting.

5. Other Business

Dr. B. SEDLAČEK (Czechoslovakia) had suggested the preparation of a world directory of scientists working in macromolecular science. Considering the huge amount of work involved and the financial difficulties of this project, the Division Committee considered that the proposal could not be taken into consideration at the present time. On the other hand, in several countries lists of polymer scientists existed. In order to make them accessible, Members of the Division were asked to send the address of existing organizations to the Secretary of the Division. This would be very useful for organizing future meetings.

**Joint Meeting of Macromolecular Division Committee
and Sections on Organic Coatings (VI.6) and on Pulp,
Paper, and Board (VI.7)**

17 July 1971

Present: Prof. H. BENOIT, Prof. C. G. OVERBERGER, Prof. G. SMETS, Dr. J. W. BARRETT, Prof. C. E. H. BAWN, Prof. S. OKAMURA, Dr. G. M. KLINE, Sir HARRY MELVILLE, Prof. W. J. BAILEY, Prof. B. RÅNBY, Dr. J. DE VRIES (Macromolecular Division Committee); Mr. P. H. FINK-JENSEN, Mr. A. TOUSSAINT, Mr. M. A. GLASER, Dr. J. A. W. VAN LAAR, Dr. L. A. O'NEILL, Prof. D. PAGANI (Section on Organic Coatings); Dr. K. WARD, Jr., Dr. C. A. SANKEY (Section on Pulp, Paper, and Board); Dr. W. GALLAY, Dr. R. W. CAIRNS (Officers of Applied Chemistry Division).

Prof. BENOIT acted as Chairman for the meeting. In his opening remarks he described the activities of the Macromolecular Division Committee, the Commission on Macromolecular Nomenclature, and the working group on structure and mechanical properties of commercial polymers. He considered the present meeting as a first contact during which the relative position of each of the participating bodies should be described.

Dr. CAIRNS and Dr. GALLAY explained the point of view of the *ad hoc* Committee on Applied Chemistry set up by the Executive Committee of IUPAC, regarding the future of the Sections on Organic Coatings and on Pulp, Paper, and Board.

Mr. FINK-JENSEN, Chairman of the Section on Organic Coatings, described its activities (see *Information Bulletin* No. 40, June 1971, p. 18-23). He insisted strongly that the existence of the Section should not be discussed and it should remain as a distinct body, to whatever Division it was attached, although his preference was to remain in the Applied Chemistry Division. Similar comments were given by Mr. GLASER, and Drs. O'NEILL and VAN LAAR.

Dr. WARD gave a summary of the activities of the Pulp, Paper, and Board Section, mainly concerning the organization of future symposia.

At the end of the meeting it was pointed out by Dr. KLINE that the merging in 1967 of the Section on Plastics and High Polymers of the Applied Chemistry Division with the new Macromolecular Division had been a success for both the Section's nomenclature work and for the working group on mechanical properties. It was also pointed out by Prof. BENOIT that the Division was interested in the applied field and would promote concerted research in this sense.

After the joint meeting, a meeting of the Macromolecular Division Committee was held in order to discuss its attitude. It was decided to undertake a further exchange of existing documents before deciding its definitive attitude; in any case, the activity of the Macromolecular Division would not be bound to a given industrial Section. A sub-committee to submit a report to the Division was formed: Prof. OVERBERGER (Chairman), Dr. BARRETT, Dr. DE VRIES, and Dr. RING. This report would be discussed at the Division Committee meeting in 1972.

COMMISSION ON MACROMOLECULAR NOMENCLATURE (IV.1)

18–22 July 1971

Present: Dr. K. L. LOENING (Chairman), Dr. L. C. CROSS (Secretary), Prof. P. CORRADINI, Dr. R. B. FOX, Dr. W. RING, Prof. G. SMETS, Prof. T. TSURUTA (Titular Members).

1. Minutes of Previous Meeting (6–9 July 1970)

These were taken as read [*Information Bulletin* No. 39 (February 1971), p. 36]. Individual items were dealt with as they arose during the meeting.

2. Membership

- (i) The Commission welcomed Dr. W. RING as a new Titular Member in the place of Dr. C. SUHR (Germany).
- (ii) The Commission agreed to support the proposal that Prof. N. A. PLATÉ became a Titular Member of the Commission in the place of Prof. V. V. KORSHAK (USSR).

3. Publications

The Commission agreed to ask the Macromolecular Division Committee to seek authority for publication of the following during the next two-year period:

- (i) Tentative Rules for the Nomenclature of Regular Single-strand Organic Polymers (after 1972 meeting),
- (ii) Tentative Rules for the Stereochemical Nomenclature of Polymers (before 1973 meeting).

4. Meetings of Commission

The view was expressed strongly, at the end of the meeting, that its studies could not be carried out diligently, efficiently and quickly if the Commission was required to meet in the disturbing atmosphere of an IUPAC Conference.

5. Tentative Rules

The printed versions of the Commission's two tentative documents were reviewed in the light of comments received:

Tentative Nomenclature Appendix No. 12 (February 1971) to *Information Bulletin*—List of Symbols for Synthetic Polymers and Polymer Materials

Tentative Nomenclature Appendix No. 13 (February 1971) to *Information Bulletin*—Basic Definitions of Terms Relating to Polymers

As it was intended that these tentative documents should be made definitive at the Commission's next meeting, Members were asked to send comments and suggestions for any additions to the Secretary by 1 March 1972. Suggestions for extension of the list of basic definitions should be sent also to Prof. TSURUTA.

6. Work in Hand

- (i) A document on *Nomenclature of Regular Organic Polymers* (2nd Draft) provided by Dr. Fox, was given detailed consideration. He agreed to provide a revision and Members were asked to comment before 1 March 1972, as it was intended to issue this as tentative after the 1972 meeting.

(ii) Brief consideration was continued, but not completed, of Prof. CORRADINI's document on *Stereochemical Nomenclature of Polymers*. It was intended that this topic would be the major study at the 1972 meeting. Prof. CORRADINI would prepare a revised version for that meeting and it was planned to issue this nomenclature as tentative in 1973.

7. Correspondence

(i) *Nomenclature for Individual Groups of Polymers according to the Structure of the Main Chain* by Prof. KORSHAK. Consideration was postponed until the 1972 meeting in the hope that a Russian Member would attend.

(ii) *A Preliminary Draft of a Tentative Proposal for Polymer Stereochemical Nomenclature* by F. A. BOVEY. This document would be considered at the next meeting as part of the study of stereochemical nomenclature [see Item 6(ii)].

(iii) *Representation of and Description of Steric Structure and Conformation of Molecules* by M. PERALDO. This document was received. Issues raised by it and relevant to the stereochemical description of polymers would be considered next year [see Item 6(ii)].

(iv) Other correspondence, including ISO/TC 61 material received via Dr. G. M. KLINE, was dealt with as appropriate under the considerations recorded in Items 5 and 6.

8. Miscellaneous Matters

The Secretary was instructed to ask the IUPAC Secretariat to provide each Member of the Commission with a copy of *Nomenclature of Organic Chemistry: Sections A, B & C* (1971) to assist in the development of the nomenclature of organic polymers.

9. Next Meeting

This would be in Belgium around 5–10 June 1972. Prof. SMETS would make the arrangements.

ANALYTICAL CHEMISTRY DIVISION COMMITTEE

16 and 19 July 1971

Present: Prof. W. KEMULA (President), Prof. P. W. WEST (Past-President), Mr. R. W. FENNELL (Secretary), Prof. R. BELCHER, Prof. C. DUVAL, Prof. H. FREISER, Prof. N. TANAKA.

1. President's Opening Remarks

The President welcomed the Members present and regretted that, for health reasons, Profs. ALIMARIN and FISCHER had been unable to come to Washington. He recalled the deaths since the last Conference of Prof. ERDEY, Prof. SILLÉN, Dr. SCHÖNIGER, and Prof. FEIGL, and asked the Committee to stand for a moment in remembrance of these former colleagues.

Prof. KEMULA said that the Division was working very well and gave his opinion that it was one of the most effective Divisions in IUPAC. He wished to record his appreciation of the efforts of all Members of the Division Committee and especially of the assistance he had received from Prof. WEST, the immediate Past-President.

2. Minutes of Previous Division Committee Meeting

The minutes of the meeting at Cortina d'Ampezzo (1969), as published in *Comptes Rendus XXV Conference*, were approved.

3. Election of Committee Members

(i) *Election of Vice-President (President-Elect) 1971-73.* The Division President nominated Prof. TANAKA (Japan) as Vice-President (President-Elect). There were no other nominations. Prof. TANAKA expressed great pleasure at his election. He would serve the Division and IUPAC to the best of his ability but would, of course, need the advice and cooperation of the whole Division in order to fulfil his duties effectively.

(ii) *Report of N/E Committee 1969-71.* The report of the Chairman of the N/E Committee, Prof. HUME, was read out. The results of the elections were:-

Division Secretary: Mr. R. W. FENNELL (UK)

Committee Members: Prof. I. M. KOLTHOFF (USA), Prof. O. SAMUELSON (Sweden), Prof. B. TRÉMILLON (France), Prof. T. S. WEST (UK), Prof. YU. A. ZOLOTOV (USSR).

The President asked the Secretary to write to the Members of the N/E Committee expressing the Division's appreciation of their work.

(iii) *Election of N/E Committee 1971-73.* Dr. A. HULANICKI was elected Chairman of the N/E Committee for 1971-73. The Secretary was asked to fill the remaining two places on the Committee from a short list of names.

4. Teaching of Analytical Chemistry

The Secretary reported that Prof. HUME had revised the report presented at Cortina d'Ampezzo, taking into account the comments of the Division Committee. The revised report had been approved by the Division Executive Committee and sent, via the IUPAC Secretariat, to the Committee on Teaching of Chemistry.

5. Division Finances

The Secretary summarized the estimates and expenditure for the years 1969, 1970, and 1971. It was noted that the Contingency Fund for 1971 was almost exhausted. The necessity for real justification of applications for Commission meetings in 1972 was stressed. It was felt that meetings of Members of Commission V.1 in connection with CEE business should be funded from the CEE Contract payments and not be charged to the Division. The Committee supported a proposal that the Division Executive Committee meeting should be held in Kyoto at the time of the Congress on Analytical Chemistry.

6. Sponsorship of Symposia

The Secretary reported the symposia supported by the Division which had been granted IUPAC sponsorship. Commission V.7 had strongly supported IUPAC sponsorship for the International Meetings on Activation Analysis at Saclay, France (October 1972); the President would seek the advice of the Commission on the proposed International Radio Carbon Dating Conference in New Zealand (October 1972).

7. International Office for Analytical Chemistry

The Secretary reported that the Bureau had set up an *ad hoc* Committee with the membership proposed for the Division's working group. This Committee had met in Graz in 1970 and the Division Executive Committee had supported the *ad hoc* Committee's recommendations in principle. The Bureau had accepted the report and subsequently appointed another Committee to examine organizational details, especially finance. This second Committee would report to the Bureau in Washington.

8. General Rules of Division

The Secretary explained the difficulties that could arise if the President-Elect was elected after the elections for vacancies on the Division Committee. It was agreed that Division Rule 1.108 should be reworded: "The Division Committee shall elect, from amongst its Members, a Division Vice-President (designated as President-Elect) not later than two years before assuming the office of President. This election shall be conducted by a procedure agreed by the Division Committee at the proceeding Conference, shall be completed before 1 September of the year preceeding the Conference at which the successful candidate assumes office, and shall be subject to approval by Council."

The Secretary referred to his written comments on a possible means of speeding up the publication of tentative reports. It was agreed that, as there was a statutory eight-month period for comments after publication of the Appendices to the *Information Bulletin*, during which time Members of the Division Committee might also comment, the President should assume responsibility for Division authority for publication of tentative reports without the necessity for reference to the whole Division Committee. Final versions of reports would still be referred to the whole Division Committee for approval or comment. The Secretary was asked to amend Section 5.3 of the Division Rules accordingly.

9. Compendium of Analytical Nomenclature

After discussion it was agreed that a collection of the Division's final (definitive) nomenclature reports into a single volume was, in principle, a good idea. It was necessary, however, that all the published reports should be reviewed

and, if necessary, updated. The Secretary was asked to invite Profs. FREISER and T. S. WEST to examine the practicalities of producing a compendium of analytical nomenclature and report back to the Division Committee.

10. Formation of Unified Data Base for Analytical Chemistry from Various Sources

Prof. TANAKA's proposal was discussed, particularly with respect to Prof. HUME's proposal considered at the Division Open Meeting. It was agreed that the two projects could be run in parallel and that each project leader should form an *ad hoc* group to examine the problems involved. Coordination between the two groups and the Interdivisional Committee on Machine Documentation in the Chemical Field was essential. Prof. TANAKA's project should be named *Preliminary Investigation on Information Storage and Retrieval in Analytical Chemistry*.

11. Cooperation with Other Organizations

The names of organizations with whom liaison might be established or strengthened would be forwarded to the IUPAC Secretariat by the Division Secretary.

12. Programmes of Commissions

The proposed programmes and personnel of the Commissions were discussed and, after some amendments, approved by the Division Committee. It was agreed that:

- (i) The project on Standard Substances should be transferred from Commission V.3 to V.1 at the next Conference.
- (ii) Commission V.3 should take into consideration ICSU and ISO recommendations in its project on *Presentation of Analytical Methods for Publication* and that, when Commission recommendations followed those already published in journals, due acknowledgement should be made and the approval of the editor(s) of the journal(s) sought.
- (iii) There was no need at present to form a special committee to coordinate work in various Commissions concerned with trace analysis. Commission Chairmen agreed to keep one another informed of progress in this field. The situation would be kept under review.
- (iv) Revisions of the tables of pK values published by Commission V.5 should be undertaken by V.6. Revisions of tables of oxidation-reduction potentials should be the subject of agreement between Commissions V.5 and V.6.

13. Matters Arising from Division Open Meetings

- (i) *Coordination of Activities of Commissions*. It was agreed that, to improve the awareness of Commissions of the work going on in the Division, the Secretary would circulate a list of all projects to Commission Chairmen and Secretaries in advance of publication of the *Comptes Rendus*. If possible, the timetable for the next Conference should allow for a meeting of Secretaries before the Commission meetings and for a meeting of Commission Chairmen and Secretaries after the Commission meetings but before the final Division Committee meeting.
- (ii) *International Office for Analytical Chemistry*. The Division Committee agreed (5 votes to 1) to endorse the resolution passed at the Division Open Meeting supporting continuation of the work of the *ad hoc* Committee.

COMMISSION ON ANALYTICAL REACTIONS AND REAGENTS (V.I)

15-18 July 1971

Present: Prof. R. BELCHER (Chairman), Dr. A. HULANICKI, Prof. F. PELLERIN, Mr. F. J. REIDINGER, Prof. S. SIGGIA (Titular Members), Dr. J. BARTOS, Dr. M. KAPEL (Associate Members).

1. Commission Officers

Profs. BELCHER and PELLERIN were nominated for a second four-year term of Titular Membership and as Chairman and Secretary, respectively, of the Commission.

2. Commission Membership

(i) Drs. BARTOS and KAPEL were nominated to fill Titular Membership vacancies caused by the retirement of Profs. H. KIENITZ and J. ZÝKA.

(ii) Dr. A. M. G. MACDONALD (Associate Member) had tendered her resignation for health reasons. The three vacancies for Associate Membership were filled by the following nominations: Prof. G. DUYCKAERTS (Belgium), Dr. M. PESEZ (France), Dr. M. HARMELIN (France).

The Chairman expressed his appreciation of the services rendered to the Commission by the retiring Members; this was unanimously approved by all Members of the Commission.

3. Studies in Progress

(i) *Determination of Phenols.* The report submitted by Prof. PELLERIN and Dr. BARTOS was considered and approved by the Commission. This report would provide the basis of a future publication in this field.

(ii) *Identification and Determination of Amines.* Prof. SIGGIA would circulate a report to Members of the Commission in October 1971.

(iii) *Study of Redox Indicators.* Dr. HULANICKI would prepare a report for January 1972.

(iv) *Identification and Determination of Polyphenols.* This project was added to the general list of topics associated with the CEE work. The report would be prepared by Dr. BARTOS, Prof. PELLERIN, and Dr. PESEZ, and it would be submitted in April 1972.

(v) *Miscellaneous Projects*

- a. Metals in water
- b. Pesticides
- c. Air pollutants
- d. Carbonyl
- e. Sulphur compounds

Work on these projects was postponed until some of the present projects had been completed.

(vi) *Standard Substances.* Commission V.3 had asked Commission V.1 to undertake future work concerned with standard substances. The Commission agreed to do this subject to approval by the Division Committee.

4. CEE Contract

The Commission considered Prof. PELLERIN's report on the present state of the various methods. The report was adopted and subsequently discussed at

a joint meeting with the Food Section. As a result of that meeting the following conclusions were reached:

- (i) The submission of reports to CEE was conditional on editorial revision of the texts. This work would be undertaken by Dr. KAPEL and the final version would be prepared by Dr. KAPEL and Prof. PELLERIN who would meet in Paris on 8 September 1971. The final document would be sent to Prof. TRUHAUT for submission to CEE in October 1971.
- (ii) The Commission accepted the proposals made by Prof. PELLERIN regarding revision of the methods submitted under the 1968 and 1969 contracts. The first group comprised 11 methods, the submission of which should be deferred for the present. It would be desirable for more modern and more sensitive methods to be studied.

Groups 2 and 4 contained 34 methods which had been accepted subject to some modifications of detail.

The 5 methods of group 3 had been provisionally accepted and could be submitted to CEE. Their eventual replacement should, however, be envisaged after further studies.

5. Next Meeting

The Members of the Commission proposed to meet in Paris on 9 May 1972. (Since that time Prof. PELLERIN had asked that the meeting be rearranged for 8 May 1972.)

COMMISSION ON MICROCHEMICAL TECHNIQUES AND TRACE ANALYSIS (V.2)

17–18 July 1971

Present: Dr. O. G. KOCH (in the Chair), Prof. K. L. CHENG, Dr. N. E. GEL'MAN, Dr. G. INGRAM (Titular Members); Prof. H. MALISSA, Prof. G. H. MORRISON, Dr. M. PÍNTA (Associate Members).

In view of the sudden death of Dr. SCHÖNIGER (Commission Chairman) on 23 February 1971 and the absence of Dr. LÉVY (Commission Secretary), the meeting was opened in the presence of the Division President, Prof. KEMULA, and the Division Secretary, Mr. FENNELL. Prof. KEMULA said some words in memory of Dr. SCHÖNIGER, then he presided during the elections. The Commission elected unanimously Dr. O. G. KOCH as its new Chairman and Dr. M. PÍNTA as the new Secretary. The Chairman paid tribute to the excellent contributions to IUPAC of Drs. SCHÖNIGER and LÉVY and expressed the thanks of the Commission for their work.

1. Reports

The following reports were submitted to the Division Committee for final approval:

- (i) *Study on Sources of Errors in Elementary Organic Microanalysis* (March 1971—Project Leader: LÉVY)
- (ii) *Study on Purification of Chemicals used for Trace Analysis* (May 1971—Project Leader: KOCH)

2. Projects Completed

- (i) *Trace Analysis applicable to Determination of Minor Impurities in Chemicals. I—General Survey* (1969–1971—Project Leader: PÍNTA)
- (ii) *Trace Analysis applicable to Determination of Minor Impurities in Chemicals. II—A Study of Trace Impurities in Oxygen and Helium* (1969–1971—Project Leaders: CHENG and MORRISON)

3. Projects in Progress

- (i) *Study on Accuracy and Precision of Determination of Fluorine in Organic Compounds* (Start: 1969—Project Leader: MACDONALD)

Samples for the further examination of fluorine methods were sent out in March. Their distribution had been delayed by the postal strike in UK. (Estimated date of completion: 1972)

- (ii) *Expression of Errors in Organic Analysis* (Start: 1969—Project Leader: MACDONALD)

Because of the importance of this project and the small number of scientists so far contacted, the Commission suggested that Dr. MACDONALD be sent some additional addresses of laboratories for an extension and completion of the enquiry. (Estimated date of completion: 1972)

- (iii) *Study on Accuracy and Precision of Determination of Nitrogen in Organic Compounds* (Start: 1969—Project Leader: VEČEŘA)

The Project Leader was not present and no report had been submitted to the Commission. The Secretary would contact Prof. VEČEŘA for further information (the project should be completed in 1972).

(iv) *Study on Accuracy and Precision of Carbon and Hydrogen Determinations in Organic Compounds containing Heteroelements* (Start: 1969—Project Leader: GEL'MAN)

Dr. GEL'MAN brought the test substances to Washington and asked the Commission to distribute them. The Chairman agreed to take action. After distribution and sample analysis, Dr. GEL'MAN would submit a report to the Commission. (Completion date: 1972)

(v) *Study on Accuracy and Precision of Determination of Metals in Organic Compounds excluding Simple Residue Determinations* (Start: 1969—Project Leader: G. INGRAM, Coinvestigator: GOMIŠČEK)

Seven substances had already been distributed to four laboratories. Three further substances would be sent to these collaborators. The work had been delayed by the postal strike in UK. (Completion date: 1972)

(vi) *Study on Mass Absorption Coefficients used in Electron Beam Microanalysis* (Start: 1967—Project Leader: MALISSA)

Prof. MALISSA had presented a report at the Graz meeting (1970) of the Commission. The Commission approved this report. Prof. MALISSA informed the Commission that the project was still in progress. He would contact Dr. HEINRICH at NBS on this subject. (Completion date: 1972)

4. Proposed New Projects

(i) *Destruction of Organometallic Compounds*

Determination of Carbon and Hydrogen (and Nitrogen) (Project Leader: TEREŇEVA, Consultant: LÉVY) (Completion date: 1973)

More and more organometallic compounds were in use and their analysis presented special problems which should be studied.

(ii) *Destruction of Organic Matter*

Preconcentration of Elements for Trace Analysis (Project Leader: CHENG, Coinvestigator: MIZUIKE) (Completion date: 1973)

Physical methods were sometimes not sensitive enough for trace analysis and therefore an enrichment was first necessary. Difficulties of destruction of organic matter and their elimination should be studied.

(iii) *Availability of Standards for Trace Analysis* (Project Leader: KOCH) (Completion date: 1973)

There was a need for complete information about the availability of trace element standard materials used in different countries. An enquiry was necessary.

(iv) *Evaluation of Methods of Calibration in Trace Analysis*

Fundamentals (Project Leader: MORRISON) (Completion date: 1973)

Several methods of calibration were possible in trace analysis. It was necessary to study the most accurate method as a function of elements to be determined and materials to be analyzed.

(v) *Trace Analysis Applicable to Determination of Minor Impurities in Chemicals*

Trace Analysis of High Purity Reagents

Application to Mineral Acids (Project Leader: PÍNTA) (Completion date: 1973)

This project was in response to a proposal from the Soviet National Committee, to study the unification of analytical techniques.

5. Membership

In addition to Dr. PÍNTA, the following were nominated for Titular Membership of the Commission: Dr. S. GOMIŠČEK (Yugoslavia), Dr. A. M. G. MACDONALD (UK), Prof. G. H. MORRISON (USA). New Associate Members proposed were: Dr. M. GRASSERBAUER (Austria), Dr. R. LÉVY (France), Prof. J. MINCZEWSKI (Poland), Prof. A. MIZUIKE (Japan), Dr. E. A. TERENT'ÉVA (USSR), Prof. M. VEČEŘA (Czechoslovakia).

6. Next Meeting

The Chairman proposed that the next meeting should be held in Europe in 1972. The exact date and place would be decided and communicated by correspondence.

COMMISSION ON ANALYTICAL NOMENCLATURE (V.3)

15-18 July 1971

Present: Prof. H. M. N. H. IRVING (Chairman), Prof. T. S. WEST (Secretary), Dr. O. MENIS, Prof. O. SAMUELSON, Prof. E. B. SANDELL, Dr. H. ZETTLER (Titular Members); Dr. D. AMBROSE (Associate Member).

The Commission noted, with regret, Prof. W. FISCHER's wish to resign from Associate Membership.

1. Introduction

The Chairman welcomed Dr. ZETTLER who was attending a Commission meeting for the first time, and outlined the Commission's programme particularly in relation to the joint meetings with the Commission on Automation of the Clinical Chemistry Section of the Union, and with the *ad hoc* working group on the nomenclature of separation processes. The Commission noted with regret that its appeal for a subvention for Prof. A. J. B. ROBERTSON to attend the meeting had not been successful.

2. Confirmation of Minutes

The minutes of the meetings held in Cortina d'Ampezzo (1-4 July 1969) and London (25 November 1970) were duly confirmed.

3. Matters Arising from Minutes

The transfer of the project on standard substances to Commission V.1 was approved. Dr. W. I. STEPHEN would work with Commission V.1 on this project but when his period of Membership of Commission V.3 expired in 1973, it was agreed that his Membership should also be transferred to Commission V.1. The Division Committee had approved the transfer of the project to Commission V.1. This item would therefore no longer appear on the Commission V.3 list of projects, and since Dr. STEPHEN was the project leader and was not engaged in any other of this Commission's projects, it was agreed that he should report any progress to Commission V.1.

Notwithstanding the discussions at the London meeting, the Commission decided that the project on selectivity index should remain a project of this Commission alone, since it was principally a matter of nomenclature. Nevertheless, it was agreed that Prof. BELCHER should be asked to join, as previously, in the Commission's working group.

4. Secretary's Report on Status of Projects

The Secretary's reports on the status of projects, dated 29 July 1970 and 23 March 1971, were received. It was noted that the final report on ion exchange was now completed and had gone forward for publication in *Pure and Applied Chemistry*. Comments had been received on the tentative reports on chromatography, trivial names, normality-molarity, and mass spectrometry, from the Division Committee. If the points raised could be dealt with at Washington, these reports could be published as Tentative Nomenclature Appendices to the *Information Bulletin*. No comments had been received on *Terminology for Thermal Methods of Analysis* from the Division Committee and this had, therefore, gone forward for publication as tentative nomenclature. The Commission noted, with satisfaction, that it had documents on all the other projects except *Standard Substances* before it.

5. Nomenclature of Chromatography

The points raised by the Division Committee were considered and satisfactorily resolved. It was noted in particular that the definitions 5.1-5.3 and 5.5 should *not* be formulated as they were self-evident. It was agreed that the Secretary should amend the previous report as necessary and that it should now go forward for publication as a Tentative Nomenclature Appendix to the *Information Bulletin*.

6. Trivial Names

Comments received from the Division Committee and *via* the Interdivisional Committee on Nomenclature and Symbols were discussed and resolved satisfactorily. It was agreed that the report should use the systematic name of reagents defined according to (i) IUPAC nomenclature, and (ii) *Chemical Abstracts* nomenclature. Prof. S. VEIBEL of the Commission on Nomenclature of Organic Chemistry had agreed to check the IUPAC list. A *Chemical Abstracts* list was already provided by Dr. K. L. LOENING.

It was agreed that the Chairman would take the necessary action and that the report should then be presented for publication as tentative nomenclature *via* the Division Secretary, as an Appendix to the *Information Bulletin*.

7. Scales of Working

Comments received from the Microchemistry Group of the Society for Analytical Chemistry and elsewhere were discussed and various amendments were made to the previous report, particularly in relation to ranges of Trace Analysis, Microtrace, Nanotrace, *etc.*, Analysis. The earlier report of Commission V.2 was not in conflict with the present report. It was agreed that there was some discrepancy on the upper and lower limits of the Microtrace regions. The Commission did not resolve whether the Microtrace range should be from 10^{-3} – 10^{-6} ppm, Nanotrace from 10^{-6} – 10^{-9} ppm, Picotrace from 10^{-9} – 10^{-12} ppm, or whether it should be defined from the upper trace limit (100 ppm) so that Trace ranged from 10^2 – 10^{-4} ppm, Microtrace from 10^{-4} – 10^{-7} ppm, Nanotrace from 10^{-7} – 10^{-10} , *etc.* It was agreed that this report should now go forward to the Division Committee for publication as tentative nomenclature.

8. Standard Substances

This project had now been transferred to Commission V.1. There was no progress to report.

9. Contamination Phenomena

The report prepared by Prof. FISCHER and Dr. ZETTLER and modified by the Secretary along lines suggested at the London meeting of 1970 was discussed extensively. It was agreed that a modified report would be prepared by the Secretary following checking of some of the items against those recommended by the Commission on Colloid and Surface Chemistry. This would then be submitted for publication as a Tentative Nomenclature Appendix to the *Information Bulletin*.

10. Nomenclature of Mass Spectrometry

This report had been submitted to the Division Committee for comment. The comments received had been presented to the project leader, Prof. ROBERTSON, who had reformulated the questioned definitions for the Com-

mission. These were accepted and some of the definitions were simplified in the interest of clarity. It was agreed that the report should be submitted for tentative publication and that copies should be sent to a list of specialists in several countries, which had been presented by Prof. ROBERTSON.

11. Nomenclature for a Selectivity Index

The idea of the selectivity index nomenclature was discussed by the Commission. A plan of action was formulated and it was agreed that a report should be prepared by the Secretary, Dr. BAUDIN, and Prof. BELCHER for consideration at the London meeting in 1972.

12. Concept of Normality and Molarity

Comments received from the Division Committee were considered. These were accepted and it was agreed that this report should go forward for publication as tentative nomenclature with an expanded introduction to be prepared on behalf of the Commission by the Chairman and Secretary. The introduction should stress that the concept of normality was not at variance with the IUPAC definition of the mole, but was based on it and that the concept was of the utmost use in industrial analysis, *etc.* The comments of ISO in support of the general concept of normality (VAL) were noted with approval.

13. Presentation of Analytical Papers for Publication

The reports on presentation of gravimetric and spectrophotometric methods for publication, prepared by Dr. KIRKBRIGHT's working group, were accepted and their general suitability was agreed by the Commission. Insufficient time was available for extensive discussion of these reports which had just become available at the Conference.

It was agreed that Commission Members would study these reports and send their comments in due course to the Secretary. The Commission expressed its pleasure at the expedition and thoroughness with which the reports had been produced.

14. Nomenclature for Kinetic Methods of Analysis

The list of terms proposed for definition by the project leader, Dr. SVEHLA, was approved. It was agreed that work should proceed along the lines suggested.

15. Liquid-liquid Extraction

The Division Committee had approved reopening of this nomenclature project and it was agreed that the terms and definitions should be extended along lines suggested by the Chairman.

16. Interdivisional Committee on Nomenclature and Symbols

The Chairman, who also acted as Secretary of the Interdivisional Committee, reported on the uncertain nature of the future of this Committee. The Commission endorsed his view that it should be strengthened and its work encouraged. Its presence within IUPAC was felt to be essential.

17. Future Programme

The Commission noted that most of its projects were still active and that those on the nomenclature of selectivity index, kinetic methods, presentation of analytical methods for publication, had just begun. In addition, it had reopened nomenclature on liquid-liquid extraction. It was agreed, after discussion, that the Commission would request permission to work on a project on definitions within analytical chemistry of sensitivity, detection limit, precision and accuracy. It was noted in particular that Commission V.4 had evolved a set of tentative nomenclature for these concepts and that Prof. KAISER was the project leader. The Commission also resolved to request permission to undertake projects on the nomenclature of data processing in analytical chemistry and on the presentation of papers for publication on the topic of ion selective electrodes. This latter project would be undertaken in conjunction with the Commission on Electroanalytical Chemistry in the sense that it would oversee the recommendations prepared by this Commission.

18. Membership of Commission

Prof. WEST was nominated for a further two-year period of Titular Membership and would continue as Secretary. Special permission would be sought from the Bureau to extend Prof. SANDELL's Titular Membership beyond the limit of eight consecutive years. Prof. G. BAUDIN (France) and Prof. A. J. B. ROBERTSON (UK) were nominated as new Titular Members. New candidates proposed as Associate Members were as follows: Dr. A. C. DOCHERTY (UK), Prof. G. G. GUILBAULT (USA), Prof. H. KAISER (Germany), Dr. G. F. KIRKBRIGHT (UK), Dr. N. M. RICE (Republic of South Africa), Prof. O. SAMUELSON (Sweden), and Dr. G. SVEHLA (UK).

19. Any Other Business

The Commission held joint meetings with the Clinical Chemistry Section's Commission on Automation to expand, eventually, the previously published nomenclature on automation in analytical chemistry. A joint paper on the outcome of these meetings would be agreed by the Chairmen and Secretaries of the two Commissions and would be duly circulated.

Following discussions on the nomenclature of chromatography with the *ad hoc* working group on the nomenclature of separation processes it was decided that the *ad hoc* group might be disbanded.

20. Date and Place for Next Meeting

Subvention for a meeting of the Commission in London, probably in November 1972, had been requested. Most of the Members involved were residents in UK. Those required to travel from abroad would include Dr. BAUDIN, Dr. ZETTLER, Prof. SAMUELSON, and Prof. SANDELL. This request was based on the assumption that sufficient funds would be provided.

COMMISSION ON SPECTROCHEMICAL AND OTHER OPTICAL PROCEDURES FOR ANALYSIS (V.4)

15-18 July 1971

Present: Prof. H. KAISER (Chairman), Prof. V. A. FASSEL (Secretary), Prof. C. Th. J. ALKEMADE, Mr. L. S. BIRKS, Dr. A. KVALHEIM, Dr. E. PLŠKO (Titular Members); Prof. J. P. ROBIN, Prof. J. D. WINEFORDNER (Associate Members).

1. Minor amendments and corrections were made to the document *Nomenclature, Symbols, Units, and Their Usage in Spectrochemical Analysis-I: General Atomic Emission Spectroscopy*.

2. The Commission concurred with the recommendation of the Analytical Chemistry Division Committee to delete Section VII from the document discussed in (1) above. Since the new Section VII had not received the wide circulation and publication of a Tentative Nomenclature Appendix to the *Information Bulletin*, it was necessary to delete this Section in order to assure adoption of the rest of the document by Council for publication in final (definitive) form.

3. The Commission endorsed the plan to identify Section VII of the Part I document discussed in (1) above as the following *Nomenclature, Symbols, Units, and Their Usage in Spectrochemical Analysis-II: Terms and Symbols Related to Analytical Functions, Sensitivity, Limit of Detection, Accuracy, and Precision*. It was hoped to submit this document to the Division Committee by January 1972 for approval.

4. The third version of the document entitled *Nomenclature, Symbols, Units, and Their Usage in Spectrochemical Analysis-III: Analytical Flame Spectroscopy and Associated Procedures* was discussed in detail. Corrections and additions were identified; these would be applied in drafting a fourth revision. The fourth revision would be circulated to Commission Members by 1 January 1972. Prof. ALKEMADE had served as project leader for this document.

5. Two new nomenclature projects were approved; the relevant details were summarized as follows:

(i) *Nomenclature, Symbols, Units, and Their Usage in Spectrochemical Analysis-IV: Analytical X-Ray Spectroscopy and Associated Procedures*

Project Leader: L. S. BIRKS
Coworkers: J. L. DE VRIES, J. T. ROBIN, P. JENKINS
Expected duration: Two years
Justification: To systematize the nomenclature in this rapidly expanding field and to form a logical and necessary extension of Parts I-III

(ii) *Nomenclature, Symbols, Units, and Their Usage in Spectrochemical Analysis-V: Systematic Classification and Description of Spectrochemical Radiation Sources*

Project Leader: E. PLŠKO
Coworkers: B. F. SCRIBNER, H. KAISER, J. WALTERS, B. W. BOUMANS
Expected duration: Four years
Justification: Radiation sources commonly used in analytical spectroscopy had been previously classified on a

historical and empirical basis. It was highly desirable to develop an internationally acceptable classification based on more scientific and physical considerations.

6. The Commission heartily endorsed the view that existing IUPAC bodies be utilized for the organization of interdisciplinary conferences and societies. The Commission also concurred with the *ad hoc* Committee on Interdisciplinary Matters' recommendations to allow special arrangements for the publication of proceeding volumes.

7. Regarding Membership of the Commission, the Division President would seek special permission from the Bureau to extend the Titular Membership of Prof. FASSEL for two more years. He could then become Chairman of the Commission, following the retirement of Prof. KAISER, and ensure continuity in the leadership until 1973. The following Titular Members were nominated for a second four-year term: Prof. ALKEMADE, Mr. BIRKS, and Dr. E. PLŠKO. Mr. B. F. SCRIBNER (USA), Prof. J. P. ROBIN (France), and Prof. J. D. WINEFORDNER (USA) were nominated as new Titular Members, with Mr. SCRIBNER to act as Secretary of the Commission. The expertise of Prof. KAISER and Dr. KVALHEIM was retained by recommending their appointment as Associate Members.

COMMISSION ON ELECTROANALYTICAL CHEMISTRY (V.5)

15-18 July 1971

Present: Prof. R. G. BATES (Chairman), Prof. P. ZUMAN (Secretary), Mr. E. BISHOP, Dr. Z. GALUS, Prof. L. MEITES, Dr. D. D. PERRIN, Prof. B. TRÉMILLON (Titular Members); Prof. S. BRUCKENSTEIN, Prof. J. F. COETZEE, Prof. T. FUJINAGA (Associate Members); Prof. N. TANAKA, Dr. J. K. TAYLOR (National Representatives).

1. Election of New Officers

Following the earlier resignation of Prof. KOLTHOFF as Chairman, Prof. BATES had been elected in his place by mail ballot. At the first meeting the resignation of Prof. ZUMAN as Secretary was announced and Prof. COETZEE was elected in his place.

2. Minutes

The minutes of the meeting in Cortina d'Ampezzo (1969) were approved.

3. Reports

Two reports were in press: a translation of *Potentials d'Oxydo-Réduction des Corps minéraux en Solution aqueuse* (CHARLOT, TRÉMILLON), and *Purification of Dimethylsulfoxide for Electrochemical Experimentation* (REDDY). Three reports had already been approved by the Division Committee and were awaiting final IUPAC approval: *Purification of N-Methylacetamide and Tests for Purity* (TRÉMILLON), *Pyridine: Purification and Tests for Purity* (MUKHERJEE), and *Purification of Propylene Carbonate and Tests for Purity* (FUJINAGA). Four new reports were approved by the Commission and would be submitted to the Division Committee: *Status of Faraday Constant as an Analytical Standard* (BISHOP), *Classification and Nomenclature of Electroanalytical Techniques* (MEITES, NÜRNBERG, ZUMAN), *Status of Electroanalytical Chemistry in India* (KAPOOR), and *Dissociation Constants of Organic Bases* (PERRIN). The report by Dr. PERRIN was constructed in the same style as his original tabulation (supplement to *Pure and Applied Chemistry*, 1965), and extended the number of bases covered from 3,000 to 7,000. The desirability to update KORTÜM's compilation of *Dissociation Constants of Organic Acids* [*Pure and Applied Chemistry* 1 (2-3) (1960)] was to be indicated to the Division Committee.

4. Continuing Projects

(i) Dr. PERRIN would submit addenda to his compilation of *Dissociation Constants of Organic Bases* on a continuing basis.

(ii) Similarly, Profs. MEITES and ZUMAN (with support from the US Public Health Service) and Prof. FUJINAGA were engaged in projects of broad scope involving compilations of polarographic data and would submit regular progress reports. For the remaining continuing projects, reports would be submitted within the periods indicated below.

(iii) *Purification of Background Electrolytes* (GALUS, KEMULA). A preliminary report was presented by Dr. GALUS. It was decided to extend the scope of the project to other selected electrolytes with the participation of Mr. BISHOP (one year).

(iv) *Purification of Solvents* (BATES, BRUCKENSTEIN, COETZEE). The Commission had already generated reports on the purification of the solvents

indicated above, as well as earlier reports on ethylenediamine (BRUCKENSTEIN) and acetonitrile (COETZEE). It was decided to extend the project to acetic acid, *N*-methylformamide, *N*-methylpropionamide, *N,N*-dimethylformamide, sulfolane and perhaps one or two additional solvents. It was intended to terminate the project after two more years, to update earlier reports, then recommend publication of all reports together as a monograph.

(v) *Electroanalytical Methods* (MEITES, NÜRNBERG, ZUMAN). Reports would be submitted on definitions (six months) and symbols (one year). It was proposed to cooperate with Commission V.3 on recommendations for the presentation of electroanalytical data.

(vi) *Pretreatment of Solid Electrodes* (BRUCKENSTEIN; one year).

(vii) *Halfwave Potentials in N,N-Dimethylformamide and Sulfolane as Solvents* (COETZEE). Preliminary reports were submitted; final reports including relevant properties of the pure solvents were in preparation (three months).

(viii) *pK Values in N,N-Dimethylformamide as Solvent* (KOLTHOFF, CHANTOONI; one year).

(ix) The desirability of continuing with a series of reports on the status of electroanalytical chemistry in various countries (patterned after the KAPOOR report) would be discussed with the Division Committee.

5. New Projects

An important new activity of the Commission would be to produce Position Papers on certain topics of unusually broad scope. In these, the general status of the field would be outlined briefly, specific problematical features of the field would be indicated, and the scope of the project would be defined. Position Papers would be submitted on projects 4(iii) and 4(vi) above, as well as on 5(i), 5(iv), and 5(v) below within the periods indicated.

(i) *Conditional Diffusion Coefficients* (BISHOP, GALUS). It was the consensus of the Commission that at present it was a tedious task to extract data on diffusion coefficients (also for metals in mercury) from widely scattered sources, and particularly to judge their reliability. This field was typical of those for which the creation of a Position Paper seemed particularly desirable (two years, including final report).

(ii) *Recommended Symbol for the Medium (or solvent) Activity Coefficient* (COETZEE, TRÉMILLON; final report, six months).

(iii) *Standardization of Ion Selective Electrodes and Scales of Ion Activity* (BATES, ROBINSON; brief report, six months).

(iv) *Application and Potentialities of Electroanalytical Methods in Environmental Analysis* (coordinator: TAYLOR; present collaborators: FUJINAGA, NÜRNBERG; Position Paper, six months).

(v) *Standard Reference Materials for Calibration of Electroanalytical Techniques* (coordinator: TAYLOR; would solicit collaborators from various countries; Position Paper, two years).

(vi) *Standard Potentials in Fused Salts* (TRÉMILLON; report, two years).

6. Liaison with Other Commissions

In a joint meeting with Commission I.3, the Electrochemical Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was discussed. Strong disagreement with some of the proposed symbols and definitions was expressed by several Members of Commission I.5. In a meeting with Prof. HUME liaison between Commissions V.5 and V.6 was

discussed. Cooperation with Commission V.3 on Project 4(v) was proposed. It was agreed that agendas for future meetings would be exchanged; it also seemed desirable to schedule a joint session for the two Commissions at future IUPAC Conferences. In response to enquiries from Dr. COOK (Chairman of Commission V.7) and Mr. FENNELL (Division Secretary) concerning the possible creation of either an intercommission committee or a new Commission on trace analysis, it was resolved to report to the Division Committee that Commission V.5 would cooperate in constituting such a body. Further information would be required before a choice could be made between the two alternatives indicated.

7. Elections

Prof. ZUMAN had resigned as Secretary, and Prof. TRÉMILLON and Dr. PERRIN had been proposed for Membership of the Division Committee and of Commission V.6, respectively. Prof. MEITES was nominated for a second four-year term of Titular Membership. Prof. T. FUJINAGA (Japan) and Dr. H. W. NÜRNBERG were nominated as new Titular Members. New Associate Members were nominated as follows: Prof. E. PUNGOR (Hungary), Dr. J. K. TAYLOR (USA), Prof. B. TRÉMILLON (France), and Prof. P. ZUMAN (USA). Some suggestions for appointment of National Representatives were made: Dr. D. D. PERRIN (Australia), Dr. P. O. KANE (UK), Prof. J. JORDAN (USA).

Joint Meeting of Commission on Electrochemistry (I.3) and Commission on Electroanalytical Chemistry (V.5)

Present: Prof. R. G. BATES (V.5), Mr. E. BISHOP (V.5), Prof. H. BRUSSET (I.3), Prof. J. F. COETZEE (V.5), Dr. I. EPELBOIN (I.3), Prof. T. FUJINAGA (V.5), Dr. Z. GALUS (V.5), Prof. R. HAASE (I.3), Dr. W. J. HAMER (I.3), Prof. J. JORDAN (I.3), Prof. W. KEMULA (V.5), Dr. E. LEVART (I.3), Prof. L. MEITES (V.5), Prof. G. MILAZZO (I.3), Dr. R. PARSONS (I.3), Dr. D. D. PERRIN (V.5), Dr. A. SANFELD (I.3), Dr. R. TAMAMUSHI (I.3), Prof. N. TANAKA (V.5), Prof. B. TRÉMILLON (V.5), Prof. P. ZUMAN (V.5).

15 July 1971

A draft prepared by Prof. KORTYA and Dr. PARSONS on an Electrochemical Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was discussed. The following comments and proposals were presented.

1. Symbols z_B (charge number of an ion B) and z (charge number of cell reaction) might be confusing. To avoid this confusion, the use of an alternative symbol (e.g., n) for z was proposed.

2. The emf and the electrode potential should be defined operationally. To distinguish the emf from the electrode potential symbolically, the following way was suggested: E_{cell} for emf (whole cell reaction), and $E(1)$ or E_1 for electrode potential of electrode 1.

3. There were several different understandings of the conditional (or formal) electrode potential. The emf of a cell such as $\text{Ref}|\text{Fe}^{3+}, \text{Fe}^{2+}, 1\text{M KCl}|\text{Pt}$, might be called a conditional electrode potential when the Nernstian logarithmic term was equal to zero. The formal electrode potential was often used to represent the emf of the above-mentioned cell when the concentrations of both Fe^{3+} and Fe^{2+} were extrapolated to zero.

4. It was understood that Dr. PARSONS would revise the definition of mixed potentials by considering the comments by Prof. MEITES.

5. It was decided to introduce a definition of ionic conductivity (or molar conductivity of an ion B), $\lambda_B = Fu_B$. The names of molar and equivalent conductivities would be discussed further with Commission I.1.

6. The definition of transport number would be modified.

7. The recommended symbol for an average quantity $\langle \rangle$ had a specified meaning in statistics. To give a specific symbol for the average in general should be avoided.

8. In equations, $\Delta_R^\Delta V(I) - \Delta_R^\Delta V(0)$ and $\eta_A = \Delta_R^\Delta V(I) - \Delta_R^\Delta V(0) - I\delta R$, Δ should be eliminated, and V should be replaced by a new symbol given to the electrode potential.

9. Separate symbols should be retained for current and current density.

10. The surface area of an electrode should be defined.

11. It was agreed to introduce a definition of the rate of diffusion, $k_D = D/\delta_D$, in conjunction with the diffusion layer thickness.

12. The definition of limiting currents should be revised.

13. Regarding the current-potential plots, it was proposed to plot the independent variable (the quantity controlled experimentally) on the X-axis. On the other hand, some preferred to plot the electrode potential on the X-axis, irrespective of experimental conditions.

17 July 1971

The list of selected definitions, prepared by Commission I.3, to be published as an Appendix to the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was intended to be restricted to general terms. Commission V.5 proposed either to prepare an exhaustive list of symbols and terms organized systematically and select from this list all those terms which deserved definition, or, alternatively, to prepare a single document covering definitions of quantities used in most important analytical techniques.

After prolonged discussion the final opinion of Commission V.5 was formulated: that whereas that Commission would prepare a publication of one final version of the Appendix, it reluctantly accepted that Commission I.3 would proceed with the proposal of the list of symbols and definitions of some of the general electrochemical quantities, whereas Commission V.5 should proceed with the preparation of a list of symbols and names of quantities used in electroanalytical chemistry.

Commission I.3 considered this approach satisfactory and promised to include some of the symbols suggested by Commission V.5. The resulting version of the report would be circulated to both Commissions and would include a policy statement indicating incompleteness.

Objections raised to the symbol E , to the signs of cathodic and anodic currents, and to presentation of current-voltage and similar plots were discussed. A cooperation on double layer phenomena between the two Commissions was planned.

COMMISSION ON ANALYTICAL RADIOCHEMISTRY AND NUCLEAR MATERIALS (V.7)

16-18 July 1971

Present: Dr. G. B. COOK (Chairman), Dr. W. W. MEINKE (Secretary), Dr. M. B. A. CRESPI, Prof. L. KOSTA, Dr. A. A. SMALES, Prof. R. E. WAINERDI (Titular Members); Dr. F. GIRARDI, Prof. N. SAITO (Associate Members).

1. Reports Published

An Enquiry into the Purity of Commercial Radiochemicals
Pure and Applied Chemistry **21**, 87 (1970)

Radioactive Tracers in Inorganic Chemical Analysis
Pure and Applied Chemistry **26**, 255 (1971)

Preparation of Reference Samples for Uranium in Low Grade Ores
Pure and Applied Chemistry **27**, 291 (1971)

2. Survey Article on High Energy Photon Activation

A draft of this survey article was discussed and approved in principle. A deadline of 30 October 1971 was set for additions and corrections. Submission of the final draft of the article to the Division Committee was expected by the end of 1971.

3. Survey Article on Light Element Analysis by Radio-analytical Methods

The prepared outline was discussed and modified. Detailed plans for a broadened article were discussed and assignments made for individual participation. The collection of information and the structural concept would be developed by April 1972 for the Kyoto meeting of the Commission. Drafts of the completed article would be available for the meeting in 1973.

4. Intercomparison of Analytical Methods: OECD Characterization Exchange

Scientific leaders of the OECD Characterization Exchange would meet in Paris in October 1971 to prepare drafts of the OECD short-form report for this Exchange. At the Kyoto meeting, the Commission would consider requests from OECD for preparation of detailed, long-form, scientific reports.

5. Reference Materials for Trace Analysis

The Commission considered availability and homogeneity information available on a number of selected materials and decided to recommend detailed studies on three materials of special significance to trace analyses in the biological and geochemical areas. The recommended materials included dried, powdered, orchard leaves (SRM 1571) and glass wafers doped with 61 elements at the 1-ppm (SRM 614/615) and 0.02-ppm (SRM 616/617) level. (These three materials were available from the NBS Office of Standard Reference Materials.) Another material which might be recommended in the future for trace analysis was calcium carbonate (99.99% purity).

6. Analysis of Nuclear Materials: Uranium Oxides and Graphite

Progress had been hindered by the resignation of Prof. SMYTHE (Associate Member). It was expected to have drafts of these papers available by the Kyoto meeting of the Commission in April 1972.

7. Information Sources for Analytical Radiochemistry and Nuclear Materials

A preliminary draft of a critical review of existing review articles was discussed and the importance of the project reaffirmed. A revised draft would be available for discussion in April 1972 in Kyoto. The possibility of listing in several languages vital radioanalytical information had not received the support from expected users necessary to make the effort worthwhile. Therefore this aspect of the project had been dropped.

8. Nomenclature

Part I of the nomenclature report had been circulated to relevant IUPAC Commissions for comment. Part II was discussed in Washington; the concept was modified to focus on terms offering particular difficulty.

9. Purity of Reagents

The answers to the circular letter on purity of reagents used in analytical radiochemistry was inconclusive and did not suggest an urgent need for action. However, recent concern in the literature about the chemical, radiochemical, and radioactive purity of commercial radioactive preparations suggested that the purity of radioactive preparations should be kept under constant review.

10. Convention for Flux Monitoring

A discussion of the *Texas Convention* for measurement of 14-MeV neutron fluxes was held and details for its revision were proposed. A revised draft would be submitted for approval at the next Commission meeting in Kyoto.

11. Nuclear Methods for Determination of Key Elements

Several elements had assumed major world importance, especially recently, in connection with pollution. Radioanalytical methods could play a vital role in measuring such elements, but the literature needed critical review in the first instance concerning the determination of lead, mercury, and cadmium. The Commission planned to initiate such a review for these elements.

12. Methods of Analysis of Fissile Elements

No coordinated discussion was available of the many present methods for determining the content of fissile elements in various materials. A detailed outline of this proposed review would be discussed at the Kyoto meeting.

13. Survey Article on Separation Techniques in Radio-analytical Chemistry

Elemental separation was a vital part of radioanalytical chemistry. At present there was a plethora of separation techniques, several of recent development, which could be used. It was the intention of the Commission to systematize and critically review this subject.

14. Elections

Since Drs. COOK and MEINKE had represented the Commission as Chairman and Secretary, respectively, for the six years of its existence, they requested that new Officers be elected. As a result Dr. CRESPI was elected Chairman and Prof. WAINERDI as Secretary. New Titular Members nominated were Dr. F. GIRARDI (Italy), Prof. N. SAITO (Japan), and Dr. J. C. WHITE (USA). Associate Members nominated included Dr. D. COMAR (France), Dr. SHANKAR DAS (India), Dr. E. STEINNES (Norway). The expertise of Drs. COOK and MEINKE was retained by their appointment as Associate Members. The hope was expressed that Dr. T. A. RAFTER (New Zealand) and Dr. E. SZABO (Hungary) could be appointed as National Representatives to the Commission.

15. Next Meeting

The Commission decided to request permission of the Division Committee and the Bureau to hold its next meeting in Kyoto during April 1972 in conjunction with the IUPAC-sponsored International Congress on Analytical Chemistry. This general analytical meeting provided an excellent forum at which to discuss the programme of the Commission in relation to other analytical aspects of chemistry. In addition, it was expected that a Commission meeting in Kyoto would contribute to the improvement of the general cognizance of IUPAC in the analytical international community through direct interactions with other formal and informal organizations covering the subject of analytical radiochemistry.

OPEN MEETING OF ANALYTICAL CHEMISTRY DIVISION

19 July 1971

1. President's Opening Remarks

The Division President, Prof. KEMULA, welcomed all Members of the Division present and presented apologies for absence and good wishes from Profs. ALIMARIN and FISCHER who, for health reasons, were unable to come to Washington. He asked the meeting to stand for a moment in memory of Profs. ERDEY, SILLÉN, FEIGL, and Dr. SCHÖNIGER.

The President said that the Division was very active in an extensive field and quoted the publication record over the past two years and the efforts of Members of the Division in the Bureau's *ad hoc* Committee on an International Office for Analytical Chemistry and of Commission V.1 on the IUPAC-CEE Contract as evidence of this activity. As with all flourishing concerns, organizational problems arose which he hoped would be settled before the end of the Conference.

Prof. KEMULA expressed his gratitude to retiring Members of Commissions and hoped they would retain an interest in IUPAC. He thanked the retiring Members of the Division Committee, Profs. ALIMARIN, BELCHER, and DUVAL, for their service to the Division and expressed his particular gratitude to Prof. P. W. WEST who after twenty years service, the last eight of which were as an Officer, was leaving the Division but not IUPAC. Prof. WEST said that it had been a personal pleasure to serve in the Division and thanked all Members for their friendliness and cooperation during his period of service.

2. IUPAC Travel

Mr. RATCLIFFE (IUPAC Secretariat) explained the financial advantages to IUPAC of the group travel schemes which had been arranged for the Conference and other IUPAC meetings. Prof. KEMULA thanked Mr. RATCLIFFE for his explanation and for the work he had put into the arrangements for the Conference.

3. Election Results

Vice-President (President-Elect). Prof. KEMULA said he was pleased to announce that the Division Committee had elected Prof. N. TANAKA (Japan) as Vice-President (President-Elect) for 1971-73. Prof. TANAKA said that it would give him great pleasure to serve the Division and that he hoped for the cooperation of the whole Division so that he might carry out his duties effectively.

Division Secretary. Prof. KEMULA announced that no formal ballot had been necessary as only Mr. R. W. FENNELL (UK) had been nominated. Mr. FENNELL thanked the Division for its confidence, but reminded Members that the Division rules allowed a term of eight years *only* for the Secretary, so that now was the time to start thinking of a replacement.

Committee Members. The President announced the results of the elections to fill the vacancies occurring in the Division Committee:-

- Zone: America — Prof. I. M. KOLTHOFF (Commission V.5), USA
- Other
- Countries — Prof. Ø. SAMUELSON (Commission V.3), Sweden
- France — Prof. B. TRÉMILLON (Commission V.5)

UK	— Prof. T. S. WEST	(Commission V.3)
USSR	— Prof. YU. A. ZOLOTOV	(elected unopposed. Had worked for Commission V.3)

Prof. KEMULA welcomed these new Members to the Committee.

4. International Office for Analytical Chemistry

The Secretary said that the Bureau had appointed an *ad hoc* Committee with the same membership and similar objects to those recommended at the XXVth IUPAC Conference for a Division working group. The *ad hoc* Committee had reported (Vienna, 1970) to the Bureau who had accepted the principle of the Office, but had set up a new smaller Committee to examine details, especially finance. Prof. MALISSA had represented the Division on this Committee which would be reporting to the Bureau at this Conference. Prof. MALISSA added some details on the proposals that were being suggested. After considerable discussion, it was proposed by Prof. MARCUS, seconded Prof. BELCHER, and carried:

the Division agrees that the current efforts of the *ad hoc* Committee on the International Office for Analytical Chemistry set up by the Bureau in Vienna, 1970, should be continued and encouraged.

5. Cooperation with Other Organizations

The Secretary referred to the letter from the IUPAC Secretariat on the *ad hoc* Committee on Interdisciplinary Matters which had been circulated to all Commissions. He hoped that Commission Chairmen would provide lists to the Division Committee at its final meeting. It was suggested that ICSU should organize collaboration between its member Unions. On the other hand, it was thought that the official ICSU link was at too high a level and that cooperation might be more effective at a lower working level; some international organizations were not members of ICSU.

6. Key-coding of Abstracts of Papers to Indicate Presence of Numerical and Other Data

Prof. HUME introduced a paper describing a simple scheme for the use of a two-letter code symbol at the end of the abstract of a paper to indicate the presence of numerical or graphical information in the paper. Prof. KAISER referred to the work of UNISIST in computer data retrieval, but Prof. HUME stated that his proposed system, although it would be compatible with computer-based retrieval systems, was designed essentially for traditional data-handling procedures. It was suggested that Prof. HUME should set up an *ad hoc* Committee to investigate the problem.

7. Coordination of Division Activities

Prof. KEMULA outlined four points for consideration:

- (a) the transfer of existing projects from one Commission to a more appropriate Commission;
- (b) the need for Commissions to review each others' reports so that contradictions did not occur;
- (c) a means of checking that duplication of work within the Division did not occur;
- (d) the problem of the Division's efforts in trace analysis.

The Division Committee would welcome the views of the Division, especially on points (c) and (d). The Secretary reported that some discussion on all these points had already taken place at the very useful meeting of Secretaries held at the beginning of the Conference. Additional administrative action on points (a) and (b) could be taken with little difficulty.

There was lively discussion on coordination of the programmes of Commissions, particularly on trace analysis. The structure of the Division was such that some Commissions were concerned with areas of work and others with techniques. There was a strong feeling that an inter-Commission committee should be formed to ensure coordination of work; on the other hand, some Members felt that it was the duty of the Division Committee to do this work. There was a general feeling of lack of awareness in Commissions of the projects undertaken by other Commissions. The Secretary explained that, with the schedule imposed by the period available for the Conference, it was not possible to collate information from all Commissions before the final Division Committee meeting but that all Conference Reports should be available for this meeting. It would be possible, however, to circulate lists of all Commission projects to Commission Chairmen and Secretaries in advance of publication of the *Comptes Rendus*, which should give more details. Minutes of out-of-Conference Commission meetings would be found in the *Information Bulletin*.

The President thanked the Members of the Division for their remarks which would be taken into account at the final meeting of the Division Committee at which Commission Chairmen were invited to be present.

APPLIED CHEMISTRY DIVISION COMMITTEE

15 July 1971

Present: Dr. W. GALLAY (President), Dr. R. W. CAIRNS (Vice-President), Dr. I. E. PUDDINGTON (Secretary), Dr. K. HOSHINO, Dr. W. G. STOLL, Prof. R. TRUHAUT. The Chairmen of the Sections of the Division were also in attendance.

I. Opening Remarks

Dr. GALLAY welcomed the group and commented on the purposes, structure, financing, and programme of IUPAC.

2. Division Activities

The President pointed out that most of the useful function of IUPAC was performed in the Sections and Commissions. Division Committees co-ordinated and planned the more general structure. Sections might thus be created, transferred, or phased out when it seemed desirable to do so in the common interest. Liaison with other bodies with similar or complementary activities, both within or outside the IUPAC structure, was highly desirable. Comment was invited.

It appeared that most Sections did in fact have considerable liaison with the IUPAC family and specific instances were cited by Drs. LANGLYKKE, EGAN, HURTIG, and Mr. FINK-JENSEN. Dr. EGAN distributed copies of a very useful chart illustrating various interests that were shared with the Food Section.

Dr. EGAN commented on the joint work of the Food Section and IUFST. The latter was a multidisciplinary group embracing nutrition, food analysis, and chemical engineering. It could probably absorb adequately the Food Section of the Applied Chemistry Division. It was suggested that IUFST might be invited to participate in the XXIVth IUPAC Congress. A subject like 'novel sources of food' would be a suitable joint theme. Dr. EGAN reported that the Food Section had received an invitation from AOAC to consider arrangements for collaborative studies. Such collaboration might extend to other Sections of the Applied Chemistry Division and to other Divisions, and the matter might need consideration by the Bureau.

Dr. HURTIG mentioned that the two Commissions of the Pesticides Section were set up in 1965 to get a number of nucleated activities under the common umbrella of IUPAC. These Commissions were now in the process of providing methods of chemical analyses that should have wide international acceptance. The Pesticides Section had active liaison with OECD, FAO, SCOPE, and WHO on this subject.

Dr. FREYSCHUSS described cooperation between IUPAC and OECD, IAWPR, and COWAR on water quality.

Mr. FINK-JENSEN said that IUPAC seemed to be the only body to co-ordinate the work of a number of regional organizations involved with various phases of protective coatings. It was estimated that about 10,000 chemists were involved. Mr. FINK-JENSEN and Drs. HEINERTH and FREYSCHUSS said their Sections had contacts with ISO. Unofficial contacts, via joint membership of individuals, interest of labour organizations in permissible limits of impurities in air and water, and other forms of liaison were mentioned. The discussion generated the following points:

- (i) With all external contacts the interests of chemistry should be promoted.
- (ii) Situations that gave rise to news-catching headlines were frequently undesirable.
- (iii) If the liaison reached an indefinite critical size where IUPAC sponsorship or financing was likely to be involved, the situation should be formalized as quickly as possible through the Division President and the Bureau.

3. Elections

President. Dr. CAIRNS, the current Vice-President, was elected with unanimous acclamation.

Vice-President. Dr. EGAN was nominated by Dr. FREYSCHUSS and nominations for this post and for the Elected Members were left open until the next meeting.

4. Division Structure

The President stated that this was an old subject and invited comment. Dr. CAIRNS opened the discussion by noting the vague definition in structure of the Division and that high polymers, clinical chemistry, and medicinal chemistry, all applied subjects, had been merged with existing subdiscipline Divisions. As Chairman of an *ad hoc* Committee appointed by the Executive Committee to explore ways of increasing industrial participation in IUPAC and to examine the activities of the Applied Chemistry Division, he commented that a number of suggestions had been made. These included attaching some of the current Sections of the Applied Chemistry Division dealing with industrial subjects to existing Divisions and expanding the activity of the Applied Chemistry Division in the area of environmental quality. Possible changes could include the transfer of both Sections VI.6 and VI.7 to the Macromolecular Division and the creation of a new Section on Reclamation of Solid Wastes.

Mr. FINK-JENSEN referred to the enlarged activities of Section VI.6 during the past two years. These included liaison with regional associations, and the establishment of active committees on analytical methods, brushing standards, adhesion, transport of water through paint films, and information retrieval. He noted that 50% of their Members were from industry and 40% from research institutes. He opposed transfer of the Section.

19 July 1971

1. Elections

The nominations and elections were completed. Dr. H. EGAN became Vice-President with acclamation.

The following six other Members were elected by ballot: Dr. K. HOSHINO (Japan), Dr. K. WEISSERMEL (Germany),* Dr. W. G. STOLL (Switzerland), Prof. H. SUOMALAINEN (Finland),* Dr. I. BOSUND (Sweden),* Prof. CRESPI (Italy).*

Dr. CAIRNS would contact the four new Members (*) and confirm their acceptance.

2. Division Structure

This subject was reintroduced by the President. Dr. WARD was invited to comment on the position of Section VI.7. He endorsed the plan to remove

specific industrial activities from the Applied Chemistry Division but hoped that an orderly transfer of the work to other Divisions or to international groups could be arranged. The pulp and paper industry was multidisciplinary and symposia organized by the Section had been highly successful, both scientifically and in providing good international relations. He felt that IUPAC was uniquely qualified to promote both of these aspects.

Dr. CAIRNS hoped that both Sections VI.6 and VI.7 could be associated with the Macromolecular Division and he had talked informally to Prof. WICHTERLE about this possibility. He proposed amending the recommendation to the Bureau to allow the Macromolecular Division sufficient time to hold a meeting to discuss possible mechanisms of transfer.

Prof. TRUHAUT and Mr. MONKMAN suggested caution in the transfer of parts of Section VI.4 activity to the Clinical Chemistry Section since occupational health hazards were usually assessed by chemical rather than clinical methods, and the concentrations of material dealt with in the two groups differed drastically.

In connection with environmental studies, Dr. HURTIG proposed the formation of an *ad hoc* committee to consider the question of hazards from groups of compounds that might have a spectrum of uses. Thus, halogenated hydrocarbons might be used as pesticides, as fire retardants, or as plasticizers. Confining studies to any one use could be restrictive. Heavy metals might represent a similar situation. The President would explore this possibility with the Bureau.

3. General

Since much of the work of the Division involved chemical analysis, the need for close liaison with the Analytical Chemistry Division and with other groups with similar interests was again stressed by Drs. STOLL and EGAN, and the President.

Dr. LANGLYKKE noted the great need to develop more appropriate procedures to handle details of sponsored symposia. At the present time far too much time was involved in negotiation of such items as publication rights and in other delays. He cited several examples that reflected unfavourably on IUPAC procedures.

4. International Office for Analytical Chemistry

An *ad hoc* Committee set up by the Bureau and chaired by Prof. MALISSA had favoured the formation of such an Office. After considerable discussion, the Applied Chemistry Division Committee could see little use for IOACH and did not support the proposal.

5. Section on Reclamation of Solid Wastes

The possibility of forming a new Section was discussed, with Drs. FREY-SCHUSS, HURTIG, and CAIRNS participating. It was concluded that this subject could have a very wide audience. A suitable recommendation would be made to the Bureau.

6. Reports of Section Chairmen

Brief verbal reports were presented by the Section Chairmen. These summarized their more lengthy written reports.

7. New President

Dr. CAIRNS made some brief comments on the hopes and ambitions for the future of the Division. He indicated that food and the environment were the general areas that he hoped to encourage. He looked for participation by outstanding chemists from a wide international spectrum.

SECTION ON FOOD (VI.1)

16-17 July 1971

Present: Dr. H. EGAN (Chairman), Dr. A. J. COLLINGS (Secretary), Dr. H. FISCHBACH, Dr. N. R. JONES, Dr. K. KOJIMA, Dr. R. MARCUSE, Prof. J. F. REITH, Prof. R. TRUHAUT (Titular Members); Dr. K. OHNO (Associate Member). Several Members of the Commissions on Trace Substances (VI.1.1) and on Food Additives and Contaminants (VI.1.2) were in attendance.

The Chairman, Dr. EGAN, opened the meeting by welcoming the visitors, Prof. E. VON SYDOW (IUFST), Dr. W. HOROWITZ and Mr. ENSMINGER (AOAC), and Mr. E. A. WALKER (IARC). He also welcomed the new Members who were attending their first meeting of the Section, namely Dr. OHNO, Dr. H. GUTHENBERG present as the new Secretary of Commission VI.1.2, and Dr. KOJIMA and Prof. H. D. BELITZ.

1. Minutes of Last Meeting

The minutes of the last meeting held at Leiden in September 1970 had been circulated previously and were approved.

2. Matters Arising

Dr. EGAN reported that Dr. I. BOSUND would be proposed as a Member of the Applied Chemistry Division Committee. As directed in the minutes, Dr. J. H. BUSHILL had been thanked for the work he had done for Commission VI.1.2. Since the Leiden meeting Dr. GUTHENBERG had taken over from Dr. COLLINGS the Secretaryship of Commission VI.1.2 (as from 1 January 1971). It had not proved possible to arrange a meeting between CEE and IUPAC but this was now scheduled for 4 November 1971 in Brussels.

3. Election of Chairman

Dr. COLLINGS took the Chair and called for nominations for Chairman of the Food Section. Dr. EGAN was proposed by Dr. MARCUSE, seconded by Dr. FISCHBACH, and elected unanimously.

4. Matters Introduced by Chairman

Dr. EGAN reported that at the meeting of the Applied Chemistry Division Committee possible reorganization was discussed. It was important to expand the Division's interest, especially into the areas of environmental chemistry. Prof. TRUHAUT drew Members' attention to the fact that environmental chemistry was a very important aspect of future work but it was hard to distinguish between pure and applied chemistry. Dr. FISCHBACH said that the Food Section was already very much involved in environmental chemistry since marine foods were bioconcentrators of pollutants.

5. Liaison with Other Sections

Dr. EGAN reported that at a joint meeting between the Food Section and Fermentation Industry Section liaison had been discussed. The use of single cell protein in animal and human feed was of growing interest and it was important that adequate specifications should be drawn up. It was also considered that this was an important area from the point of view of international trade. It was pointed out that the Food Section could not lay down the actual specification although it did have some information on limits set in other areas.

At the joint meeting, the Fermentation Industries Section had agreed to submit likely specifications for which methods would be required. Dr. EGAN requested that the Chairmen of the two Food Commissions should be aware of the questions likely to be put forward by the Fermentation Industries Section and if possible consider them in their future programmes.

Prof. TRUHAUT said that a project meeting on single cell protein would be held next March 1972 in Laval and that IUPAC participation would be welcomed.

6. Relations with Pesticides Section

A joint meeting had been held between the Pesticides Section and Food Additives and Contaminants Commission at which metals and other environmental contaminants were discussed. IUPAC methods for lead, mercury, and copper in food were already available, but should be reviewed in the light of modern developments. For the determination of mercury in foods the IUPAC method was insensitive and it would be necessary to apply a more modern atomic absorption finish. It was agreed that neutron-activation analysis for the determination of traces of mercury in food called for particular expertise since it could give high results. The IUPAC method for lead was considered to be adequate, but it would be desirable to include an alternative atomic absorption finish. It was agreed that consideration of methods for arsenic in food should be left to the Pesticides Section since it was also interested in organically bound arsenic.

Cadmium and copper methodology were being reviewed by the Food Additives and Contaminants Commissions. Mr. WALKER (IARC) said that there was growing interest in the role of heavy metals in cocarcinogenesis. The question of polychlorinated biphenyls was also referred to the Pesticides Section.

7. Relations with AOAC

Dr. HORWITZ (AOAC) reported that in the past IUPAC and AOAC had collaborated closely in the evaluation of analytical methods. A document was circulated to Members of the Food Section requesting closer collaboration between the Section, its Commissions, and AOAC, since this was thought to lead to mutual benefit. Dr. EGAN said that this arrangement could apply to other Commissions and Divisions and that the matter should be referred to the Division Committee, and then if appropriate to the Bureau. It would be necessary to give careful consideration to publication arrangements.

8. Relations with IUFST

Dr. EGAN introduced Prof. VON SYDOW, Secretary-General of IUFST, to the Food Section Members. Prof. VON SYDOW gave a brief history of the formation of IUFST and went back over the last few years indicating the types of area in which it had been active, especially in organizing symposia. He welcomed the suggestion of collaboration between IUPAC and IUFST since his Union was new in the field and welcomed help from other established international Unions to speed its development. After discussion of arrangements for liaison between the two Unions, it was agreed that a joint symposium would be a very good step in this direction. At the discussion the theme *Contribution of Chemistry to Food Supplies* was taken as the title. The topics suggested for the symposium were (1) Chemical Synthesis and Modification of Proteins, Fats, and Carbohydrates. (2) Natural and Synthetic Components in Food; Analysis, Chemical Properties, Function of Properties

(Flavour, Preservatives). (3) Contaminants in Food; Analysis, Toxicology, *etc.* It was thought desirable that the symposium should be held in conjunction with the IUPAC Conference and/or Congress at Hamburg in 1973. In order to improve liaison it was agreed to set up a Joint Scientific Programme Committee with three or more Members from each of IUPAC and IUFST, altogether six or eight Members. Dr. EGAN, Dr. MARCUSE, Dr. COLLINGS, and Prof. BILLEK would represent the Food Section of IUPAC.

9. IUPAC-CEE Relationship

(a) The joint Liaison Committee of the Food Section and the Commission on Analytical Reactions and Reagents had met in November 1969.

The 1971 IUPAC-CEE contract called for the supply by IUPAC to CEE of not less than twenty methods of analysis for the purity of food additives. In fulfilment of this contract the Food Section, in conjunction with the Analytical Reactions and Reagents Commission, had examined methods supplied under the 1968, 1969, and 1970 contracts with a view to bringing these up to date and had made arrangements to supply from the following at least twenty methods as required:

- (i) Seventeen methods already in hand from the 1970 contract and which would be edited for uniformity of style.
- (ii) Twenty-three methods from previous contracts for which minor amendments would be made and which would be edited for uniformity of style (List No. 2 of Prof. PELLERIN's report of 5 June 1971).
- (iii) Eleven methods from previous contracts which would be edited for uniformity of style (List No. 4 of Prof. PELLERIN's report of 5 June 1971).

Arrangements had also been made for a meeting of the CEE Scientific Committee on 4 November 1971 to discuss the basis for the IUPAC-CEE contract in 1972 with special reference to revising the basic 1966 CEE document on which the selection of methods was at present based. At the same time certain other methods from previous IUPAC-CEE contracts would be considered for further revision (and editing for uniformity of style) as follows:

- (i) Eleven methods for which a more sensitive (or more modern) approach was required (List No. 1 of Prof. PELLERIN's report of 5 June 1971).
- (ii) Five methods (together with three others) for which more modern consideration should be made, having special regard in some cases to the Food Section's programme of reconsideration of IUPAC methods published earlier (List No. 3 of Prof. PELLERIN's report of 5 June relates).

After discussing Prof. PELLERIN's paper, it was agreed that a joint editorial committee should be set up; it was decided that Dr. COLLINGS and Dr. DELMAR should represent the Food Section.

(b) At the 1970 meeting of the Food Section, dissatisfaction was expressed with respect to the function of the contract with CEE. It had been impossible to organize a meeting with CEE although one had finally been arranged for November 1971. Dr. EGAN said that the IUPAC-CEE contract was of value to IUPAC since it provided money, but it was important that IUPAC should have the right to republish the methods once they had been approved. Also he was unhappy about the poor basis now available for selection of the methods.

10. Relationship with International Agencies

Dr. EGAN welcomed Mr. WALKER from IARC, an independent WHO group. Mr. WALKER would be attending meetings of the Trace Substances Commission.

It was agreed that the solvents report should be copied to both FAO and WHO, and also to UNIDO.

II. Future Programme

(a) Dr. MARCUSE, Chairman of the Food Additives and Contaminants Commission, reviewed the items which he thought were important and should be studied by IUPAC. There was a need for a method for the determination of total mercury in food and that a method with a sensitivity of 0.01 ppm should be available. It was considered important to carry out a collaborative study of the determination of total mercury in food.

The Commission was also aware that there were existing IUPAC methods available for lead and copper in food and that these should be reexamined. It was considered that the lead method, although acceptable, would be considerably improved by the inclusion of an alternative atomic absorption finish. The method for copper should be completely reviewed; a review would be prepared on the acceptability of the available methods for determining copper in food.

A review on the determination of cadmium in food had been prepared by the Commission and this was considered to be an important trace metal. The review would be updated and published in due course. It was also considered that the Commission should bear in mind the need for a collaborative study at some future date. The Commission would also continue its work on dispersion solvents.

(b) Dr. FISCHBACH said that in the past year Dr. WASSERMAN had collected details of trace nitrosamine methodology and had prepared a review of this subject. An international meeting at Heidelberg had been organized by IARC in October 1971 at which nitrosamines would be discussed. Any decision on collaborative study should await the outcome of that meeting. In the subsequent discussion it was agreed that, in the absence of Dr. WASSERMAN, Dr. COLLINGS should represent the Section in Heidelberg. The Trace Substances Commission had also initiated a collaborative study for multidetection of polycyclic aromatic hydrocarbons.

(c) There was a continuing awareness in the area of mycotoxins and that standards for Aflatoxin M were still presenting problems. A collaborative study on milk would be carried out in October 1971. Dr. JONES said that at a recent meeting of IUFTS it was considered that residual mycotoxins in food was a much over emphasized research field. Dr. KROGH presented evidence showing that there was need for continuing work in this area, especially for the determination of citrulin in food, and he proposed to mount a collaborative study on an IUPAC basis. It was also noted that AOAC proposed to carry out an ochratoxin study in foods. The international mycotoxin check group had approached IUPAC to see if the latter would take over control of the exercise. This was thought to be worthwhile and would be referred to the Bureau of IUPAC for consideration.

(d) The Trace Substances Commission also identified the need for work in the area of single cell protein and new synthetic foods. There was a need to be able to assess the nutritional adequacy and to monitor natural toxic contaminants including trace elements. Dr. JONES said that special attention was needed for the determination of true protein, RNA, digestibility, essential amino acids, lipid fraction, and hydrocarbon content.

(e) Dr. CUTTING indicated that there was a need for methods for measuring the amount of synthetic hormones which had entered the food chain. There was also a need for the assessment of feed additive residues in food.

(f) The problem of polyphosphates in food was also discussed, but since this matter was under consideration by ISO any decision on activity in this field was postponed until contact with ISO had been established.

12. Publications

In the past year two technical reports from Commissions had been published, one on a collaborative study of a method for determination of concentration and purity of aflatoxin standards and use of the methods for measuring stability of the standards, and a second on minimum specifications for seven extraction solvents used in food processing. The *Survey of Analytical Methods available for Estimation of Some Food Additives in Foods* had appeared in *Pure and Applied Chemistry* **26**, 75 (1971).

13. Structure of Commissions

(a) Dr. EGAN referred to memoranda dated 1 February and 15 May 1971. Dr. FISCHBACH and Prof. TRUHAUT had served on the Food Section for eight years and were no longer eligible for Titular Membership. Dr. JONES, Dr. MARCUSE, and Dr. EGAN had been Titular Members for four years and their Membership was now up for review. This enabled the structure of the Section and the Commissions to be revised, the present structure having had a disproportionate number of Members of the Food Additives Contaminants Commission on the Section. Ideally, the Food Section should consist of a Chairman and Secretary, the respective Chairman and Secretary of its Commissions, together with two other Titular Members and eight Associate Members. In the following discussion it was clear that current work could be catered for by two Commissions. It was agreed that these should be designated the Food Additives Commission and the Food Contaminants Commission. Furthermore, it was agreed that the Food Additives Commission should consider the problems associated with polycyclic aromatic hydrocarbons, nitrosamines, solvent specifications, and evaluation of a programme to establish whether there was a problem in international trade in assessing the levels of feed additives in foods. The Food Contaminants Commission should consider methods for heavy metals and mycotoxins in food and the evaluation of methods for enforcing the specifications for single cell protein. It was anticipated that the work on single cell protein could become extensive and might in due course justify a third Commission being set up specifically to look at these problems. It was suggested that the Food Contaminants Commission would prepare a case to be put forward in one year's time.

(b) At subsequent meetings Dr. E. HAENNI (USA) was nominated as Chairman and Dr. A. E. WASSERMAN (USA) as Secretary of the Trace Substances Commission, most of the work of which was transferred to the Food Additives Commission. Other Members of this Commission were agreed as follows: Prof. H. D. BELITZ (Germany), Mr. F. DELMER (France), Prof. G. GRIMMER (Germany)—Titular Members; Mr. D. F. DODGEN (USA), Dr. A. EDHBORG (Sweden), Dr. S. J. KUBACKI, Prof. A. RUTKOWSKI (Poland), Mr. E. A. WALKER (IAEA)—Associate Members.

(c) Dr. MARCUSE and Dr. GUTHENBERG were reelected Chairman and Secretary, respectively, of the Food Additives and Contaminants Commission and would continue in these Offices for the Food Contaminants Commission. Other Members of this Commission were appointed as follows: Dr. N. R. JONES (UK), Dr. P. KROGH (Denmark), Dr. K. OHNO (Japan), Dr. B. L. OSER (USA), Dr. I. F. H. PURCHASE (Republic of South Africa)—Titular Members; Prof. G. BILLEK (Germany), Dr. A. D. CAMPBELL (USA), Dr. L. E.

COLES (UK), Dr. H. W. HOWARD (USA), Dr. S. TANNENBAUM (USA)—Associate Members.

(d) Further to (a) above, it was agreed that Membership of the Food Section should be as follows: Dr. H. EGAN (UK—Chairman), Dr. A. J. COLLINGS (UK—Secretary), Dr. H. GUTHENBERG (Sweden), Dr. E. HAENNI (USA), Dr. K. KOJIMA (Japan), Dr. R. MARCUSE (Sweden), Prof. J. F. REITH (Netherlands), Dr. A. E. WASSERMAN (USA)—Titular Members; Dr. L. ATKIN (USA), Dr. H. FISCHBACH (USA), Dr. J. SANDLER (Mexico), Dr. P. L. SCHULLER (Netherlands), Prof. R. TRUHAUT (France)—Associate Members.

14. Reports of Commissions

(a) Dr. FISCHBACH reported that the Trace Substances Commission had been active and that a method for Aflatoxins B and G had been published and a study on Aflatoxin M had been initiated. It had been active in evaluation of the AOAC method for mycotoxins in copra but he stressed that it was important that IUPAC work should be published. A draft of revised methodology for the cleanup of aflatoxin had been prepared and there was growing interest in ochratoxin and citrulin. For its future programme the Trace Substances Commission proposed to complete the Aflatoxin M work under Dr. PURCHASE, and Dr. KROGH was prepared to develop a collaborative study. Arrangements had also been made for a collaborative study on a multi-component method for polycyclic aromatics in food.

In the past year, Dr. WASSERMAN had reviewed methods available for trace nitrosamine determination in food but it had been agreed that although a collaborative study on nitrosamines was desirable, no decision could be made until after the meeting of IARC in Heidelberg in October 1971. Dr. JONES said that the Trace Substances Commission might usefully look at the problems associated with single cell protein and that it was important that work should be done on the lines suggested at the joint meeting between the Fermentation Industries and Food Sections.

(b) Dr. MARCUSE reported that in the past year the Food Additives and Contaminants Commission had reviewed methods available for determination of mercury and cadmium in food. It was important to mount a collaborative study on total mercury in food and to complete and update the cadmium review for publication, to provide an alternative atomic absorption finish for the IUPAC lead method, and to review the methodology for copper in foods.

15. Date of Next Meeting

Dr. MARCUSE said that the Food Section would be very welcome to meet in Göteborg in Sweden next year. It was agreed to accept Dr. MARCUSE's offer: the dates 23–25 August 1972 were thought to be the most suitable time for the meeting.

Joint Meeting of Section on Food (VI.1) and Commission on Analytical Reactions and Reagents (V.1)

17 July 1971

Present: Dr. J. BARTOS (V.1), Prof. R. BELCHER (V.1), Dr. A. J. COLLINGS (VI.1), Dr. H. EGAN (VI.1), Dr. N. R. JONES (VI.1), Dr. M. KAPEL (V.1), Dr. K. KOJIMA (VI.1), Dr. R. MARCUSE (VI.1), Dr. K. OHNO (VI.1), Prof. F. PELLERIN (V.1), Mr. F. J. REIDINGER (V.1), Prof. J. F. REITH (VI.1), Prof. S. SIGGIA (V.1), Prof. R. TRUHAUT (VI.1).

1. Prof. BELCHER opened the meeting and said that he had been invited to take the Chair by Dr. EGAN. He welcomed the joint meeting since it provided the way for better liaison between the two IUPAC bodies. Prof. PELLERIN was the new Secretary of Commission V.1. In the past year Prof. PELLERIN had obtained a number of comments on the methods which had been selected for review for the IUPAC-CEE Contract in 1971. These included all the methods which had been submitted previously by the Union. There were three main areas where the methods required amendment:

- (i) They all needed some editorial alterations.
- (ii) Some needed updating.
- (iii) Some could be replaced by simple limit tests.

In some cases the CEE requirements were for a given detection limit which was stated, whereas it was thought that in some cases simple limit tests would be preferable. Prof. TRUHAUT said that he thought acceptance of suitable limit tests was likely and suggested that he and Dr. EGAN brought the matter up at the meeting with CEE in November 1971.

2. Of the methods studied in Prof. PELLERIN's report, seventeen methods which needed editorial revision were in hand from the 1970 contract; twenty-three methods required some minor amendments; eleven required only editing. A total of fifty-one methods could therefore be put forward for the 1971 contract: the minimum number required was twenty.

Eleven further methods reviewed were thought to be unsatisfactory by present day standards and would need to be replaced by more modern methods. The question of methodology for the determination of mercury, lead, and copper in food, where IUPAC approved methods were available, was considered. It was pointed out that some of these methods were up to twelve years old and it might be better to provide an alternative modern finish, such as atomic absorption. These matters were in hand with the Food Section and it was agreed that any decision on heavy metal methodology should be deferred until such time as the work of the Section on these matters was complete. Prof. REITH noted that a number of the assays required a wet digestion stage and enquired whether a single procedure was possible for all the methods. In the following discussion it was agreed that samples could vary so much from one to another that it would be impossible to have a common digestion system.

3. It was agreed that a joint editorial committee should be appointed to mould the methods into a suitable form. Furthermore, it was agreed that all the methods should be translated into English and the translations should also be edited. The following were appointed: Prof. PELLERIN and Dr. KAPEL to represent the Analytical Reactions and Reagents Commission; Dr. COLLINGS and Dr. DELMAR or Dr. MARCUSE to represent the Food Section. It was agreed that a meeting should be arranged for 8 September 1971 in Paris to finalize the methodology. Dr. EGAN said that the meeting with CEE

had now been arranged for 4 November 1971 in Brussels and that Prof. TRUHAUT would be attending. It was hoped to modify the original document to lay down a sound basis for the selection of methods for subsequent contracts.

Joint Meeting between Section on Food (VI.1) and Section on Fermentation Industries (VI.2)

15 July 1971

Present: Mr. W. K. BRONN (VI.2), Dr. A. J. COLLINGS (VI.1), Dr. H. EGAN (VI.1), Dr. R. J. ERTOLA (VI.2), Prof. A. FIECHTER (VI.2), Dr. H. FISCHBACH (VI.1), Dr. J. C. HOOGERHEIDE (VI.2), Dr. N. R. JONES (VI.1), Dr. K. KOJIMA (VI.1), Dr. S. KINOSHITA (VI.2), Dr. A. F. LANGLYKKE (VI.2), Mr. R. F. LIGHT (VI.2), Dr. R. MARCUSE (VI.1), Dr. K. OHNO (VI.1), Prof. S. J. PIRT (VI.2), Dr. J. F. REITH (VI.1), Prof. H. SUOMALAINEN (VI.2). Dr. M. MILNER (UN PAG) and Mr. E. A. WALKER (IARC) were in attendance.

Dr. LANGLYKKE, Chairman of the Fermentation Industries Section, opened the meeting by saying that he had been invited to take the Chair by Dr. EGAN. The agenda, prepared by Drs. HOOGERHEIDE and COLLINGS, was accepted by the meeting. Dr. HOOGERHEIDE spoke of the need for single cell protein (SCP) for feed and human use, with special reference to limiting the amount of nucleic acid (RNA), trace toxic substances, heavy metals, polycyclic aromatic hydrocarbons, and mycotoxins. There was also a need to develop a chemical index of protein quality. All these considerations had been taken into account in the guidelines set up by the FAO/WHO/UNICEF Protein Advisory Group (PAG). Recommendations had been set up in various documents giving full details of the current guidelines. More complete versions of these guidelines were awaited following the recent meeting of PAG in Moscow. Dr. EGAN reported that several parts of the current programme of the Food Section would be used for enforcing the specifications for SCP. At present the activities of the Food Section included methodology for the determination of mycotoxins, polycyclic aromatic hydrocarbons, heavy metals, and nitrosamines in food. However, he stressed that the Food Section could not draw up the actual specifications required, although it had some knowledge of what limits had been set for these in other areas. The Food Section could advise on methods for enforcing the specifications and, where required, could develop the necessary methodology.

It was agreed that a statement of the general specifications desirable should be prepared by the Fermentation Industries Section, and the Food Section also agreed to identify and suggest which substances should be included in the specifications, especially those of current interest; and to bear these in mind when developing the programme of the Section for 1971-72.

COMMISSION ON TRACE SUBSTANCES (VI.1.1)

16-18 July 1971

Present: Dr. H. FISCHBACH (Chairman), Dr. A. E. WASSERMAN (Secretary), Dr. C. L. CUTTING, Dr. N. R. JONES, Dr. I. F. H. PURCHASE (Titular Members); Dr. A. D. CAMPBELL, Dr. P. KROGH (Associate Members).

Dr. FISCHBACH opened the floor for discussion of the functions of the proposed Commission as outlined by Dr. EGAN (see p. 205). He recalled that the initial terms of reference for the Commission on its formation were to study the assay procedures for aflatoxin. This was later expanded to mycotoxins and the benzo(a)pyrene study was added.

Dr. JONES, speaking for the Mycotoxins Sub-Commission, indicated that the activities on all aflatoxins except M would be completed hopefully this year, and suggested the work on Mycotoxin M be carried over to the new Commission. He also indicated that he felt the Chairman of the new Commission should control all the activities, assigning new subjects to the Members with the required expertise.

Dr. JONES noted that the proposed titles of Commissions might be too rigid, possibly excluding subjects of potential interest to the Section (*e.g.*, Fermentation Industries Section's request to this Section). He suggested retitling the two Commissions or constituting a third Commission to look at things chemically like nucleic acids, true proteins, *etc.*, in single cell protein products, since these did not fall into Food Contaminants.

Further discussion of this subject was held and it was the expression of the Commission that the Section should provide a mechanism to study the use of chemical means for determining nutritional adequacy and safety in foods, particularly in view of Dr. GALLAY's charge to Dr. EGAN to broaden the basis of the Food Section. Further to this point the Smoke Constituents Sub-Commission suggested that the Section assume the responsibility for determining the adequacy of chemical methodology for drug residues in animal products for human consumption. Discussions with regard to organization led to suggested areas of operation for the new Commissions.

SUB-COMMISSION ON MYCOTOXINS (VI.1.1.1)

16 July 1971

Present: Dr. N. R. JONES (Chairman), Dr. A. D. CAMPBELL (Secretary), Dr. H. FISCHBACH, Dr. P. KROGH, Dr. I. F. H. PURCHASE (Members).

The minutes of the Leiden (1970) meeting were discussed and accepted by the Members.

AOAC collaborative studies on raw cocoa and copra were noted and after consideration were recommended as IUPAC methods. In certain circumstances the determination might be more appropriately carried out by the extinction procedure as described in the IUPAC recommended peanut procedure (*Information Bulletin* No. 31, March 1968, p. 35). Dr. KROGH led the discussion on citrinin and ochratoxin, pointing out the need to consider both toxins simultaneously because his investigations had shown a connection between them and evidence that in at least some instances, both toxins appeared as natural contaminants in a lot of grain. He and Dr. CAMPBELL discussed recent information on incidence (ochratoxins had been found as material contaminants in Sweden, Denmark, USA, and Canada). Dr. KROGH had a method for citrinin about ready for publication and he was prepared to carry out a collaborative study.

Mr. NESHEIM, the AOAC Associate Referee for ochratoxin, had a method which appeared to be of a higher sensitivity than published methods. He was planning a collaborative study to commence in several months. It was the consensus that validated methods were needed for these two mycotoxins. It was agreed that Dr. KROGH would:

- (i) Provide the background information on citrinin to the Chairman.
- (ii) Provide the Chairman with the proposed collaborative study.

Dr. PURCHASE led the discussion on Aflatoxin M. The collaborative study was under way and the first stage of the standard stability testing was completed. He planned to conduct the analytical portion in October 1971 at the time of the second stage (storage phase) of the standard study. Dr. PURCHASE asked for discussion on methods and levels of contamination. Views were presented and Dr. JONES suggested that Dr. PURCHASE should proceed with the study in light of these discussions.

Mr. COON, Chairman of the International Aflatoxin Check Sample Committee, was not able to be present to give the preliminary report on the current study. Dr. BAUR of the Proctor and Gamble Co. presented copies of the preliminary report to the Sub-Commission and discussed it with the Members. The primary goals of this study were (i) to obtain a good evaluation of the method a laboratory was using in routine analysis, and (ii) to obtain a good evaluation of their own laboratory in relation to others using the same method. Two hundred and forty-seven laboratories throughout the world were invited to participate in this initial study and one hundred and sixty agreed to take part. Fifty-six other laboratories had indicated definite interest for future series. The Committee felt that the response was overwhelming and many comments on the need and desirability of this type of study were received. Mr. COON expected to have a final report in the latter part of August. Dr. BAUR pointed out that the efforts of many people and institutions were required to conduct this study. He asked that IUPAC consider sponsoring this work. The Sub-Commission agreed that it was a useful exercise and that it would take up the possibility of IUPAC supervision of the programme with the Food Section. It was decided that there was not

sufficient information on other mycotoxins for any action by the Sub-Commission at this time.

Dr. JONES distributed a draft of *Cleanup Procedure for Use in Aflatoxin Analysis*, and requested written comments to be sent to him. The status regarding the IUPAC peanut and peanut procedure was discussed. Dr. PURCHASE commented that it was serving a useful purpose. The BF method continued to be used extensively (an analysis could be carried out at one third or less of the cost of other aflatoxin methods) and it was by far the most used in the check sample study. This method was recently adopted as an AOCS official method, replacing the 'Celite' method. Dr. JONES suggested that the Sub-Commission continue to be on the alert for a rapid field method to be considered for adoption as an IUPAC method.

Dr. CAMPBELL mentioned a rapid field method that Mr. PONS had developed for cottonseed which reportedly had a sensitivity of about 20 $\mu\text{g}/\text{kg}$ and could be carried out in 15 min. He would contact Mr. PONS to see if prepublication copies of the method could be made available to the Sub-Commission.

The Sub-Commission endorsed the WHITTAKER approach to the sampling of peanuts.

Dr. CAMPBELL spoke about a short cut screening procedure for corn that Mr. STOLOFF had developed. He would ascertain if prepublication copies could be made available to the Sub-Commission.

SUB-COMMISSION ON SMOKE CONSTITUENTS (VI.1.1.2)

16-18 July 1971

Present: Dr. H. FISCHBACH (Chairman), Dr. C. L. CUTTING, Prof. G. GRIMMER, Dr. A. E. WASSERMAN (Members). Dr. E. HAENNI was in attendance.

1. Benzo(a)pyrene

The minutes of the meeting at Leiden (September 1970) were approved. Dr. WASSERMAN reported on the status of the recommended procedure for benzo(a)pyrene. Permission had been obtained from the author, Dr. J. HOWARD, and the AOAC journal to use this method for IUPAC. The Sub-Commission could now recommend the method to the Food Section for publication as a recommended procedure, possibly as a Technical Report Appendix to the *Information Bulletin*.

Dr. HAENNI reported that the collaborative multicomponent polycyclic aromatic hydrocarbons assay was in progress. Thirteen collaborators were involved and efforts were being made to interest several more. Participants received three coded samples of smoked ham containing four known polycyclic hydrocarbons in unknown concentrations and a check sample. The check sample contained 10 $\mu\text{g/kg}$ of each of benzo(a)pyrene, benzo(e)pyrene, benz(a)anthracene, and benzo(ghi)perylene. The unknowns contained 10 $\mu\text{g/kg}$ of each in various combinations. They were asked to follow the published procedure if possible, or give a description of their own method.

To date seven reports had been received; five used the published method with about 74% minimum average recovery reported.

Prof. GRIMMER discussed his results in comparing the published HOWARD method with his procedure. He had difficulty in separating benz(a)anthracene from benzo(a)pyrene by thin layer chromatography (TLC). In naturally contaminated foods there were many polycyclic hydrocarbons in the same order of concentration as benzo(a)pyrene. It was not possible to separate these by TLC so that UV spectroscopy was necessary.

2. Nitrosamines

Dr. WASSERMAN reported on the results of his survey of the work on nitrosamine assays carried out in various laboratories throughout the world. He prepared an outline indicating the various techniques used for preparation, cleanup, separation, determination, and confirmation of nitrosamines. He also submitted for consideration detailed procedures of five diverse assays and a listing of some of the errors and pitfalls in the entire methodology. Dr. WASSERMAN gave his opinion that the two critical areas were in the cleanup of the nitrosamines separated from a natural product and their confirmation. Dr. HAENNI noted that Dr. HOWARD's new liquid-liquid extraction procedure reduced the cleanup problem.

Before further discussion took place, Mr. WALKER reported that IARC was holding a conference on nitrosamine assay procedures in Heidelberg in October 1971. A good representation of active workers was expected to present papers, and it was hoped some consensus would be reached on a procedure. He suggested the Sub-Commission delay initiating any activity until after that meeting. Mr. WALKER was invited to submit a report of the Heidelberg meeting for distribution to the Sub-Commission Members, and if a collaborative assay was planned to invite IUPAC Members to participate.

A copy of the survey was transmitted to Mr. WALKER to further cooperative contact between IUPAC and IARC and a critical summary was provided for inclusion on the programme of the Heidelberg meeting.

3. Proposed Work for Next Year

- (i) In light of the enquiry to be made to ISO by the Food Section, to consider the necessity for methodology in determining polyphosphates in meat.
- (ii) To consider analytical procedures for the determination of nitrite, nitrate, and potential precursor amines.
- (iii) Completion of the collaborative study on the multicomponent hydrocarbons assay.

4. Proposal for Broadened Scope

- (i) To consider the problems of drug residues in animal products for human consumption.
- (ii) To consider problems of trace substances of toxic nature which might be present in relation to production of new protein substances.

COMMISSION ON FOOD ADDITIVES AND CONTAMINANTS (VI.1.2)

15-18 July 1971

Present: Dr. R. MARCUSE (Chairman), Dr. H. GUTHENBERG (Secretary), Prof. H. D. BELITZ, Dr. A. J. COLLINGS, Dr. K. KOJIMA, Prof. J. F. REITH, Prof. R. TRUHAUT (Titular Members); Dr. L. ATKIN, Dr. H. W. HOWARD, Dr. J. SANDLER (Associate Members).

1. Minutes of Last Meeting

The minutes of the Commission meeting in Leiden (14-16 September 1970) had been previously circulated and were taken as read. They were accepted.

2. Solvents for Dispersion

A draft report on specifications for eight dispersion solvents had been prepared by Dr. COLLINGS. The report which was based on information from the literature, comprised ethanol, propan-2-ol, glycerol, glycerol monoacetate, glycerol diacetate, glycerol triacetate, propan-1,2-diol, and butan-1,2-diol. The last mentioned solvent should be deleted due to limited information. After a proposal made by Dr. HOWARD, Dr. COLLINGS agreed to complete the report by the addition of specifications from the US Gras List. Dr. KOJIMA promised to deliver further information to Dr. COLLINGS. It was agreed that the Members should ask industrial firms in their respective countries to comment on the report and that collected comments should be sent to Dr. COLLINGS for a revised report to be prepared for the meeting next year.

3. Trace Metals in Food

(i) *Total and Methyl Mercury.* During the Leiden meeting it had been agreed that the future work of the Commission should include reviewing methods for the determination of mercury, especially alkyl mercury in food. Drs. MARCUSE and GUTHENBERG had accepted to study the actual situation concerning methodology for the determination of mercury and had prepared a report based on discussions with Swedish experts. The report had been sent to Members for comment. Comments and detailed descriptions of methods were received from some Members, especially Dr. KOJIMA, Dr. OHNO, and Prof. REITH. The answers were put together in a report distributed to Members at the meeting.

It was recognized that the dithizone method published by IUPAC should be abandoned and that the method of choice for the determination of total mercury in food was atomic absorption spectroscopy. The sensitivity of the method to be recommended should permit determination of mercury down to 0.01 ppm. It was agreed that Members should ask laboratories in their respective countries for their experience with regard to the determination of total mercury in foods. Copies of the paper by G. LINDSTEDT, *A Rapid Method for Determination of Mercury in Urine* [*Analyst* **95**, 264 (1970)], should be sent to about ten Members of the Commission as well as to the Section on Pesticides and AOAC with the proposal for a collaborative study to be performed with samples of fish containing low and medium levels of total mercury. The samples should be wet-combusted according to the IUPAC method. When possible, the dry-combustion method proposed by Drs. KOJIMA and OHNO in their report should also be used. Dr. GUTHENBERG agreed to send out copies of the above-mentioned paper and Dr. MARCUSE

hoped to be able to distribute the fish samples. Results should be available at the beginning of next year.

It was decided that the analytical method for the determination of methyl mercury should be deleted by the Commission and be treated by the Section on Pesticides.

(ii) *Lead*. Dr. MARCUSE reported that Drs. COLLINGS and KOJIMA had sent methods for the determination of lead. Also, Prof. REITH had commented on the lead problem. Copies of these papers would be distributed to Members. Dr. KOJIMA and Dr. OHNO agreed to test the IUPAC method, supplementing it with atomic absorption spectroscopy and Dr. KOJIMA accepted to prepare a draft report for distribution to Members.

(iii) *Cadmium*. Dr. COLLINGS had prepared a review on methods available and amounts found in food. It would be distributed to Members for comments to be sent to him. Concerning determination of cadmium in food, Dr. KOJIMA and Prof. REITH had given certain comments which would be forwarded to Dr. COLLINGS. He would then prepare a report for the next meeting. Toxicological data collected by Prof. TRUHAUT would be included.

(iv) *Copper*. Dr. MARCUSE offered to prepare a report on methods for the determination of copper in food, which was accepted.

4. Publications

Dr. COLLINGS agreed that his revised cadmium report should be forwarded to the Food Section for publication as a Technical Report Appendix to the *Information Bulletin*.

Prof. REITH proposed to ask journals in various countries to inform their readers about the existence of the Technical Reports. Dr. MARCUSE agreed to forward this proposal to the Food Section.

5. Future Work

In addition to what had been said above concerning solvents for dispersion and metal traces (mercury, lead, cadmium, copper) in food, reports on the occurrence of nitrates, nitrites, primary and secondary amines, and nitrosamines in food and on identification tests and specifications for thickening and stabilizing agents would be prepared by Prof. BELITZ.

Dr. SANDLER would prepare a report on selenium and Prof. TRUHAUT a report on fluorine. These reports would be discussed at the next meeting of the Commission.

Joint Meeting of Commission on Food Additives and Contaminants (VI.1.2) and Section on Pesticides (VI.5)

15 July 1971

Present: Dr. D. C. ABBOTT (VI.5), Dr. L. ATKIN (VI.1.2), Prof. H. D. BERLITZ (VI.1.2), Dr. A. J. COLLINGS (VI.1.2), Mr. J. W. COOK (VI.5), Dr. H. FREHSE (VI.5), Dr. R. A. E. GALLEY (VI.5), Dr. H. GUTHENBERG (VI.1.2), Dr. K. R. HILL (VI.5), Dr. H. W. HOWARD (VI.1.2), Dr. H. HURTIG (VI.5), Dr. K. KOJIMA (VI.1.2), Dr. R. MARCUSE (VI.1.2), Prof. J. F. REITH (VI.1.2), Dr. C. RESNICK (VI.5), Dr. G. L. SUTHERLAND (VI.5), Prof. G. WIDMARK (VI.5). A number of Observers were in attendance.

1. Dr. HURTIG took the Chair and invited Dr. GUTHENBERG, Secretary of the Food Additives and Contaminants Commission, to review the work of the Commission in the area of common interest with the Pesticides Section. Dr. GUTHENBERG said that IUPAC approved methods for mercury, lead, and copper in food were available but these might require modification in the light of present day developments. In the first instance the Commission had concentrated on a survey of the available methods for determination of mercury in food. He was aware that the Pesticides Section was also involved and welcomed cooperation between the Section and Commission in the prevention of duplication of effort. The IUPAC method for mercury was based on the KLEIN procedure for sample digestion and was suitable for food down to levels of 0.1 ppm. It was, however, desirable to provide an alternative atomic absorption detection procedure to the dithizone colorimetric stage. Present requirements were for a method capable of detecting 0.01 mg/kg of mercury in food. Dr. ABBOTT said that a modification of the SAC/AMC method suitable for 0.01 mg/kg was available.

2. The meeting also noted that neutron-activation analysis for mercury should be used with caution since there had been several reports of high results by that method. Prof. WIDMARK reported that the Pesticides Section had been working on detection and determination of organomercury compounds. The Food Additives and Contaminants Commission expressed interest and requested that the Food Section be kept informed of progress.

It was recognized that accuracy and precision in these analyses was particularly important and that the Food and Pesticides Sections should be reassured on the reproducibility of the methods. Mr. D. J. CLEGG (representing WHO) said that it was expected that the Joint Expert Committee of FAO/WHO would be reexamining the acceptable daily intake for mercury in the near future.

3. Whilst it was recognized that polychlorobiphenyl compounds were not pesticides, the methods used for their analysis were essentially those used for organochlorine pesticide residues. It was agreed that the Pesticides Section should continue to work in this field and that the Food Section be kept informed of the progress.

4. The use of lead arsenate as a pesticide led to overlap of interest between the two Sections. An IUPAC method for the determination of lead in food was available and was thought to be adequate, although it was agreed that the method would be improved if an alternative atomic absorption finish was added. It was agreed that the Food Section should progress this project. However, with the increasing use of organoarsenicals it was agreed that the Pesticides Section should progress methods for the detection of residues of arsenic and organoarsenicals.

5. Dr. COLLINGS reported that the Food Additives and Contaminants Commission had reviewed the methodology for detecting cadmium in food. It was agreed that the Food Additives and Contaminants Commission should continue work in this area.

6. The Pesticides Section expressed interest in the detection and estimation of organotin residues and would be considering this matter later at its meetings. The Food Section also expressed interest and requested to be kept informed of progress.

Mr. E. A. WALKER (IARC) reported that there was growing interest in the determination of trace metals in food since several had been implicated as being cocarcinogens.

It was agreed that the Food Section should continue to update the present IUPAC methods for trace metals in food.

SECTION ON FERMENTATION INDUSTRIES (VI.2)

15-18 July 1971

Present: Dr. A. F. LANGLYKKE (Chairman), Dr. F. PARISI (Vice-Chairman), Dr. J. C. HOOGERHEIDE (Secretary), Dr. R. J. ERTOLA, Prof. A. FIECHTER, Dr. S. KINOSHITA, Prof. S. J. PIRT (Titular Members); Mr. W. K. BRONN, Mr. R. F. LIGHT, Dr. H. J. PEPPLER, Prof. H. SUOMALAINEN (Associate Members). As a special guest Dr. M. MILNER, Secretary of the Protein Advisory Group (PAG) of FAO/WHO/UNICEF, attended the joint meeting with the Food Section as liaison officer, during the discussion of the project *Standards for Single Cell Protein*.

1. Minutes of Previous Meeting

The minutes of the previous meeting, held at Mexico City (17-18 August 1970), were approved without further comment.

2. Election of New Members

Four persons (Drs. PARISI, HOOGERHEIDE, and Profs. FIECHTER, PIRT,) had completed periods of Titular Membership. The Section elected Dr. S. KINOSHITA (Japan) as Vice-Chairman to succeed Dr. PARISI.

Dr. HOOGERHEIDE was reelected for another four-year term as Secretary of the Section and the Titular Members Profs. PIRT and FIECHTER were also reelected for another four-year term. Dr. I. HORVÁTH (Hungary) was elected a new Titular Member.

Dr. PARISI, by unanimous vote, was elected an Associate Member. The following Associate Members were finishing their connection with the Section: Dr. H. J. PEPPLER (USA), Mr. R. F. LIGHT (USA), Dr. H. J. BUNKER (UK), and Prof. R. DJURTOFT (Denmark).

In connection with the proposed meeting of the Section in 1976 at Berlin on the occasion of the Vth International Fermentation Symposium proposed to be held under auspices of the Institut für Gärungsgewerbe und Biotechnologie, continued representation in the Section Membership by Mr. BRONN was essential. For the four remaining vacancies for Associate Membership, the Section voted a list of prospective Associate Members and alternates including: Dr. L. STONE (USA), Dr. J. NORRIS (UK), Dr. LAINE (UK), Dr. J. JAROSZ (Poland), Prof. RALPH (Australia), Dr. P. I. BOWMAN (USA), Dr. H. LANG (Germany), Prof. MATELES (Israel), Mr. L. M. MIALI (UK), and Dr. O. HANC (Czechoslovakia).

A new Membership list of the Section would be distributed as soon as all candidates had accepted nomination and were approved by the Bureau and the respective National Adhering Organizations.

3. Cosponsorship of IVth International Fermentation Symposium (Kyoto, 20-25 March 1972)

The Section had worked diligently in support of this Symposium and in its recently distributed Second Circular the Organizing Committee recognized sponsorship by the Fermentation Industries Section of IUPAC. However, IUPAC had not yet published the fact that this was a IUPAC-sponsored meeting, an uncertainty that should be clarified as soon as possible. Other cosponsors of the Symposium were the Science Council of Japan, the Agricultural Chemistry Society of Japan, the Society of Fermentation Technology of Japan, and the International Organization for Bioengineering and Biotechnology. In addition to the Fermentation Symposium, an associated Symposium on Yeast was being planned for the same period in Japan. Attendance

of 1,100 participants was expected (650 from Japan and 450 from abroad). A total budget of \$175,000 was envisaged, including \$21,000 for publication of the proceedings. A Japanese Government contribution of \$20,000 was expected, while registration fees of \$50 per person should yield \$65,000. Thus, from other sources (industry and sponsor organizations) an amount of \$90,000 would be required. The Section suggested an increase in registration fee; \$50 was considered quite modest. No promise of subvention from IUPAC had been received; Dr. LANGLYKKE would request financial support.

Though the cost for attendance at the Symposium of the Titular Members was estimated to be almost \$10,000, it appeared that IUPAC would allot no more than \$3,000, which might hamper attendance. Dr. LANGLYKKE would try to obtain funds from other sources for USA Members. If, for financial reasons, no more than three or four Members could attend the Kyoto meeting, Oxford (UK) was suggested as a second possible location with the meeting to be scheduled during the early part of July.

Oxonian Travel Services Ltd., in cooperation with Japan Airlines, had presented a group travel plan from Europe for scientists who wanted to attend the Symposium and for Members of the Section who wanted to attend the Section meetings to be held in conjunction with this Symposium.

4. Cosponsorship of Vth International Fermentation Symposium (Berlin, 1976)

The invitation of the Institut für Gärungsgewerbe und Biotechnique to organize this Symposium in 1976 at Berlin was still valid. The Section by vote favoured IUPAC sponsorship. It was decided that the Berlin representatives would send their application for IUPAC sponsorship to the Section Chairman, who in turn would route it through the appropriate channels for approval by the Union, preferably during the Executive Committee meeting to be held during the Spring of 1972.

5. Cosponsorship of International Symposium on Advances in Microbial Engineering (Mariánské Lázně, Czechoslovakia: September 1971)

This symposium, for which IUPAC cosponsorship was granted, had been postponed until August 1972.

6. Education in Bioengineering

The Section discussed at great length the project of education in bioengineering. As a result of this discussion, a series of definitions of bioengineering and its components were accepted. The committee charged with developing a curriculum for it was instructed to develop this programme for a speciality tentatively called biochemical engineering, which would, in broad terms, be concerned with the technology of enzymatic processes and the industrial application of such processes. The committee would, by a limited enquiry directed to experts around the world, develop and propose a basic curriculum for biochemical engineering which should prepare candidates for a variety of assignments in industry and other applications of biological processes.

7. Glossary of Terms and Symbols Used in Fermentation Literature

The symbols and terms currently used in the field of fermentation technology were extremely diverse, thus leading to confusion and misunderstanding in

the interpretation of papers and patents. Since an important aim of IUPAC was development and recommendation of uniform standardized nomenclature, the Section concurred in the opinion that it was necessary to develop and submit proposals for nomenclature pertaining to this discipline. Dr. ERTOLA had prepared a glossary of terms used in fermentation technology and Mr. BRONN had presented a compilation of the most widely used symbols and terms with their various interpretations. These documents were to be reviewed by the Membership of the Section, and based upon criticism received, a manuscript on terms, symbols, and definitions would eventually be presented for publication by IUPAC. The document dealing with symbols in the application of engineering to the fermentation industries had been coordinated with the IUPAC *Manual of Symbols and Terminology for Physico-chemical Quantities and Units*, and the Section's proposals would be discussed with the Interdivisional Committee on Nomenclature and Symbols.

8. Directory of Research Laboratories in Field of Fermentation

Although there had been some objection to this project the Membership felt that it would be very useful. A number of Members submitted lists of such research laboratories for the following areas: Germany, Europe in general, Denmark, Japan, UK, and a worldwide list. A list for Latin America would be submitted in the near future. The Chairman was authorized to review the possible interest of Butterworths in publishing a directory based upon these preliminary lists and upon the advice and consultation of the Section. In case Butterworths was not interested, another publisher would be approached (Elsevier, Chemical Rubber Co., Bowker Associates).

9. Worldwide Survey of Fermentation Industry

The *Worldwide Survey of the Fermentation Industry for 1967* had been published as Technical Report Appendix No. 3 (June 1971) to the *Information Bulletin*. A decision to continue these useful surveys was held over for the next meeting.

10. Standard Methods for Determining Fermentation Power of Active Dry Baker's Yeast

At a meeting held recently in Vienna with the ICC working group, it was decided that more comparative tests would be conducted using the SCJ method (and the Distillers method). After one year a decision would be made whether or not to conduct another worldwide comparative test.

11. Standards for Protein of Microbial Origin (SCP)

A great deal of work had been done on this project. The Section, though not competent to develop food standards, was concerned that such standards be developed in order that SCP might be accepted internationally as feed and in due time also as a food ingredient. To this end the Section was co-operating with the Food Section and held an extended meeting with the Food Section on 15 July (see p. 208).

As a result of that meeting, the Section was developing a series of recommendations on elements that should be considered in the analytical appraisal of SCP which would be submitted to the Food Section for comment. In turn, the Food Section would prepare proposals for analytical control of such a new product as SCP. Close cooperation with PAG (set up by FAO/WHO/UNICEF) for similar purposes, was being maintained. The PAG group had

already prepared certain tentative guidelines and others were still under study or in process of development. This project was receiving the careful attention of the committee established for the purpose, comprising Dr. HOOGERHEIDE, Prof. PIRT, and Acad. MALEK.

12. Coordination of Activities of International Organizations in Field of Industrial Microbiology

There was extensive, perhaps undesirable, overlapping of activities of international organizations active in the field of industrial microbiology. This was in part due to poor communications between such organizations. The Section had prepared a pamphlet giving a brief description of its activities, which had been distributed widely to other organizations. The result had been that considerable contact and cooperation was established with other international organizations during the past year. The Secretary had been invited together with officers of other international organizations active in the field of industrial microbiology, to attend an informal meeting sponsored by UNESCO for the purpose of a better coordination of microbiological programmes of the different international organizations. This meeting would be held at IAEA headquarters in Vienna (13-14 September 1971) .

13. Unused Resources of Developing Countries

A list of the yearly production of raw materials (such as raw sugar, molasses, rice, cassava, sago, and corn) in fifteen Asian countries was presented by Dr. KINOSHITA. Some of these products could be used as potential raw materials for microbial production of valuable products.

14. Present Rules and Regulations concerning Sponsorship of Symposia

This subject was again discussed in detail at the Section meeting. The Chairman was authorized to pursue modification of the rules so that sponsorship of symposia could be obtained for meritorious meetings deserving of the highest level of recognition. It was agreed that publication in *Pure and Applied Chemistry* was not a desirable requirement, since experience had shown that such publication was not prompt, was expensive, and was not appropriate to the subject matter. It was also held that sponsorship of meetings should be initiated by local organizers by way of the IUPAC body most closely concerned. In the case of the series of International Fermentation Symposia, applications for sponsorship should be directed to the Fermentation Industries Section by way of its Chairman. Based upon his review, the recommendation would be forwarded to the President of the Applied Chemistry Division with copies to the IUPAC Secretariat. Unless this course was followed, applications for sponsorship were certain to lead to confusion and misunderstanding.

15. Other Considerations

The Section had given careful attention to new developments in fermentation industries. One of the most important developments from the standpoint of manufacturing volume was that of detergent enzymes. Recent concern over possible allergic effects of detergent enzymes had led to considerable concern in USA, resulting in a great reduction in the use of detergent enzymes. It was clear that a calm, analytical approach to the problem of detergent enzymes was necessary to clarify the value of these products as compared to the hazards associated with their use.

The Section also gave consideration to the growing interest in tissue culture as an industrial manufacturing procedure. So far, no new action programmes had been developed.

16. Next Meeting

The Section looked forward to meeting in March 1972 in Kyoto, at the time of the IVth International Fermentation Symposium.

SECTION ON TOXICOLOGY AND INDUSTRIAL HYGIENE (VI.4)

15-18 July 1971

Present: Prof. R. TRUHAUT (Chairman), Mr. J. L. MONKMAN (Secretary), Dr. W. G. FREDERICK, Dr. J. C. GAGE, Mr. S. G. LUXON, Dr. W. PIETRULLA, Dr. W. PILZ, Prof. P. W. WEST (Titular Members); Prof. C. BOUDENE, Prof. R. G. SMITH (Associate Members).

1. Minutes of Previous Meeting

With minor modifications, the minutes of the meeting in Cortina d'Ampezzo (July 1969) were approved.

2. Status of Methods

Some twenty-four methods were approved for publication in 1971. Twelve additional methods were under investigation by the Section for discussion and possible adoption at an extraordinary meeting to be held in July 1972.

3. Measurement of Contaminants in Air

Particulate fluoride, ozone, phosphine, benzene, methyl bromide, sulphuric acid mist, cadmium, lead fume, iron oxide fume, antimony, mercaptans, indicator tube specifications, nitroglycol, hydrazine, vanadium, nickel carbonyl, asbestos, aliphatic amines, and isocyanates were discussed. Certain methods were approved and assignments for further work distributed.

4. Industrial Solvent Analysis

Methods for benzene and halogenated hydrocarbons in bulk solvents were considered in the light of present and future governmental and intergovernmental regulations covering the permissible limits.

5. Analysis of Biological Materials

- (i) Carbon monoxide in blood
- (ii) Phenol in urine
- (iii) Lead in urine
- (iv) Cholinesterase in whole blood
- (v) Cholinesterase in red cells
- (vi) Cholinesterase in serum
- (vii) Pseudocholinesterase in serum

The toxicants and biological indicators listed above were discussed and methods for most of these were approved.

6. Community Air Analysis

The gaseous contaminants sulfur dioxide, hydrogen sulphide, oxides of nitrogen, hydrogen fluoride, and carbon monoxide, were discussed with respect to continuous or semicontinuous measurement in ambient or community air. Also discussed were the particulate contaminants sulphuric acid mist, selenium and its compounds, particulate fluoride, benzo[a]pyrene, crystalline silica, and miscellaneous metals. Sampling and measurement of the particulates was considered as a semicontinuous process.

7. Cooperation with Other Groups

(i) A report was presented by Mr. MONKMAN on material prepared for a WHO monograph on the sampling and analysis of polycyclic aromatic hydrocarbons in the environment. Arrangements were made to have Dr. P. BOGOVSKI (IARC) distribute the full text of this report to all Members of the Section.

(ii) A report was presented by Dr. PIETRULLA on the WHO Symposium on Air Quality Criteria and Guides, held in Geneva on 5-9 October 1970. Dr. PIETRULLA attended this meeting as the official representative of IUPAC. Arrangements were made to have Dr. B. PAVANELLO (WHO) distribute copies of the complete report to all Members of the Section.

(iii) Mr. LUXON reported on the WHO meeting on the Desulphurization of Fuels and Combustion Gases, also held at Geneva and which he had attended as the official representative of IUPAC. There was a consensus of opinion that there was a very great need for 'standard' methods for sulphur dioxide and for sulphuric acid mist in particulates.

(iv) Prof. TRUHAUT reported upon the various meetings of SCOPE. Working Group No. 1 of SCOPE had the assignment to assess methods for the analysis of air pollutants. The members of this group were Dr. W. GALLAY (Chairman), Dr. H. EGAN, Mr. J. L. MONKMAN, Prof. R. TRUHAUT, Prof. P. W. WEST, Prof. G. WIDMARK, all active in IUPAC.

(v) Dr. GAGE gave some details of a meeting which had been held at Stresa to discuss nomenclature. The meeting had been convened by Dr. R. DYBKAER (Commission on Quantities and Units in Clinical Chemistry) with a view to dispelling some of the confusion now existing in clinical chemistry. An example of unsatisfactory nomenclature in current use was 'milligrams per cent'. The possible extension of the ISO system throughout IUPAC was discussed.

8. Membership

A new Secretary, Prof. R. G. SMITH, and a new Chairman, Mr. MONKMAN, were chosen. Two new Members were added: Prof. M. FUGAS (Yugoslavia) and Dr. P. MUELLER (USA).

9. Publications

It was agreed, with respect to the general environment, that man could be considered as a sampling device. Since many methods were applicable to the area of community air as well as to occupational hygiene, it was considered desirable to change the name of the manual of methods somewhat as follows:

'Analytical Methods for use in Occupational Health and in the Control of Air Pollution'

There was considerable discussion pro and con of the ISO layout for method writeup and the new units which had been suggested for ISO.

On account of the rapidly increasing work load and to enable a smoother flow of methods to the printer, it was proposed to hold an extraordinary meeting of the Section in Paris in the first week of July 1972.

COMMISSION ON TERMINAL PESTICIDE RESIDUES (VI.5.1)

16-19 July 1971

Present: Dr. H. HURTIG (Chairman), Dr. K. R. HILL (Secretary), Mr. J. W. COOK, Dr. R. A. E. GALLEY, Dr. G. L. SUTHERLAND (Titular Members); Mr. E. KENAGA, Prof. F. KORTE, Dr. J. B. MOORE, Dr. P. B. POLEN, Dr. P. E. PORTER, Dr. E. Y. SPENCER (Associate Members).

1. Agenda

Members and visitors to the Sixth Meeting of the Commission were welcomed by the Chairman who explained the work of the Commission and moved adoption of the agenda; this was agreed.

2. Minutes of Last Meeting

The Chairman referred to the minutes of the Fifth Meeting held on 14-16 September 1970, which, together with appendices, had been previously circulated; these were agreed.

3. Matters Arising from Minutes

Arising from the minutes of the Fifth Meeting, the Chairman referred to the following matters:

(i) The Half-life Working Party proposed that last year's report, as published in *Information Bulletin* No. 40 (June 1971), be considered the final report since no further comments had been received from the Members; this was agreed.

(ii) The Secretary reported that the proceedings of the 1970 meetings had been published in *Information Bulletin* No. 40 (June 1971) and that summaries of the 1970 Meetings would be published in *J. Assoc. Off. Anal. Chem.* November 1971 issue.

(iii) A report of the 1970 Joint Meeting of the FAO-WHO Experts on Pesticide Residues was considered by the Commission. Compounds for which further information on terminal residues was required in order to recommend tolerances or allowable daily intakes, were identified and discussed. Working assignments arising from these requirements were deferred until pending revisions in the Membership of the Commission were completed.

(iv) A Status Report on the FAO-IAEA Programme on Pesticide Residues and Pollution was heard by the Commission. It was noted that both IUPAC Pesticide Commissions were interested in all compounds listed in Annex 1 of the Report. The proposed lines of collaboration of the Joint FAO-IAEA Division with the IUPAC Pesticides Section were accepted as modified. These were:

(a) The annual reports on IAEA Research Contracts would be forwarded to the Secretaries of both Commissions in order to keep IUPAC informed about the results of the Joint Division's pesticide programme.

(b) The Joint Division would on request inform all Members of the IUPAC Commissions or their collaborators on availability of radiotracer instrumentation and labelled compounds which might be required for investigations related to the Commissions' agenda.

(c) In cases when research contracts or agreements initiated under FAO-IAEA sponsorship dealt with subject matters covered by working assignments to Members of the IUPAC Commissions, the Joint Division would,

through the Commissions' Secretaries, keep the respective Members of the Commissions informed about the nature and results of the studies undertaken.

(d) It was intended that the IUPAC Pesticides Section be invited to delegate observers to all meetings organized by the Joint Division relevant to IUPAC's pesticide residue programmes.

(v) The Commission heard a report on the status of the residue monitoring programme of OECD. Results would be reviewed in 1971 by OECD but the laboratory of A. V. Holden would be unable to continue this monitoring work. IUPAC Pesticides Section would not be able to assist in the continuation of this programme since it was not organized for such a function.

(vi) The Chairman noted that there had been no correspondence between the Commission and CEE since last year's meeting.

4. Organochlorine Compounds

A prepublication paper on the identification of some lindane metabolites in higher plants by I. Y. MOSTAFA, P. N. MOZA and W. KLEIN was presented to the Commission. Lindane was taken up by the root systems of bean and corn seedlings immersed in an aqueous solution of the insecticide. The only metabolic products in beans were γ -pentachlorocyclohexene and 1,2,4-trichlorobenzene. In corn the same metabolites plus 1,2,3-trichlorobenzene were found. Nonpolar metabolites accounted for more than 70% of the total. With the acquisition of these results it was agreed that the work of the Commission on terminal residues of lindane was finished.

The Commission received a report on the terminal residues of chlordane (Appendix I). Experimental work was completed which showed that the animal metabolite of chlordane—oxychlordane—was not a residue in plants or soil. Residues in crops grown in soil treated with technical chlordane consisted mostly (88%) of α - and γ -chlordane. Following a discussion of the relevance of environmental residues (soil) to the Commission, the Chairman indicated that the Commission had been requested by the Applied Chemistry Division Committee to broaden the scope of its work.

The Commission heard a report on the terminal residues of the cyclodienes (Appendix II). It was noted that the most significant finding of the past year was that the dieldrin ring could be opened to give a dicarboxylic acid metabolite in corn plants. The principal animal metabolite of dieldrin, especially in humans, was 9-hydroxydieldrin. New information indicated that the dicarboxylic acid metabolite of dieldrin might be further degraded in animals. Endrin differed from dieldrin in that it was converted into a pentachloro-cage compound by sunlight. The Chairman indicated that it would be useful to the Commission if WHO would indicate its degree of concern with the quantity of photo products of cyclodienes found as residues as reported to date.

There was no new information to report on the terminal residues of toxaphene.

The Commission received a report of work in progress on the terminal residues of chloropropylate and chlorobenzilate in mammals (rats) (Appendix III). Chlorobenzilate would be deleted from future agendas since it appeared that it was no longer being manufactured.

No new information was available on terminal residues of dicofol.

A report on the terminal residues of hexachlorobenzene (HCB) was considered by the Commission (Appendix IV). There was no evidence to date that HCB was metabolized by animals or microorganisms. The ubiquitous nature of HCB was noted by the Commission.

5. Carbaryl and Other Carbamates

A report was received on the chemical nature of the terminal residues of carbaryl and other carbamates (Appendix V). The occurrence and identification of a new plant metabolite of carbaryl was reported—7-hydroxycarbaryl (as a conjugate). Progress in determining the terminal residues of carbofuran, meobal, and methomyl was noted. The Chairman announced that a monograph on carbofuran would appear in the *Residue Reviews* series. The Commission took note of the lack of work on the feeding of plant glycosides of pesticides to animals and determining the metabolism.

6. Dithiocarbamates

The Commission was pleased to receive from Dr. BATORA reprints of papers presented at the COMECON Symposium on Dithiocarbamates held in Dubrovnik in October 1970. These reported results of investigations on the metabolism of the fungicides maneb and zineb which had been published: R. ENGST and W. SCHNAAK, *Z. Lebensm.-Unters. Forsch.* **134**, 216 (1967); *ibid.* **143**, 99 (1970); *ibid.* **139**, 149 (1969); H. SEIDLER, M. HORTIG, W. SCHNAAK and R. ENGST, *Nahrung* **14**, 363 (1970); R. ENGST, W. SCHNAAK and H. RATTBA, *Nachrichtenbl. Deut. Pflanzenschutzdienst* No. 2, 26 (1968). Dr. TURTLE (FAO) indicated that there was no need for further work on mancozeb by the Commission.

7. Organophosphorus Compounds

The Commission received a report on new knowledge of the terminal residues of organophosphorus compounds, especially diazinon, malathion, and parathion (Appendix VI). Dr. TURTLE (FAO) indicated that no further work would be required of the Commission (for FAO) on malathion, diazinon, parathion (except for effects during oilseed processing), dimethoate, or demeton-S-methyl sulfoxide. No reports were received on thiometon or fenitrothion; however, Dr. HURTIG indicated that data was being developed in Canada which showed residues of fenitrothion persisting up to at least 165 days in forest duff from treatment for control of spruce budworm. The Commission received a report on the terminal residues of formothion in plants and animals (Appendix VII). The active residues after formothion treatment were formothion, dimethoate, and O-dimethoate. The degradation was slightly different in plants and animals, F-acid and polar metabolites predominating in animals.

8. Fumigants

A report was received on the chemical nature of the terminal residues of fumigants (Appendix VIII). The major metabolite of ethylene dibromide in rats after oral administration was identified as S-(hydroxyethyl)glutathione. Dr. HURTIG reported that extensive work was being conducted in Netherlands on the fate of fumigants in processing and baking with results differing from those presented in Appendix VIII. The Chairman requested that clarification be obtained from FAO as to whether the Commission had satisfied its requirements on individual fumigants.

9. Rethrins and Synergists

The Commission was informed that the reports on the chemical nature of the terminal residues of pyrethrins and piperonyl butoxide given at last year's meeting had since been published: J. B. MOORE, *Residue Reviews* **33**, 87 (1971); J. E. CASIDA *et al.*, *Nature* **230**, 326 (1971). The Commission had no further contribution to make to FAO on rethrins and synergists.

10. Other Compounds

The Commission received a report in the form of a bibliographic summary of the nature of the terminal residues of captan and folpet along with information on analytical methodology and toxicity (Appendix IX). Alteration products from the dicarbonyl portion of captan or folpet consisted of imides, phthalamic acids, and dicarboxylic acids. Epoxide formation from captan in field crops was uncertain. Alteration products from the $-SCCl_3$ moiety of captan or folpet was a more complex problem with a range of products, containing sulfur in several oxidation states, having been reported. There was no new work to report on oxythioquinox, dinocap, dichlofluanid, or quin-tozene.

11. Publication

The Secretary was authorized to arrange for publication of the complete proceedings of the Commission by IUPAC and for a summary to be published in *J. Assoc. Off. Anal. Chem.*

12. Arrangements for Next Meeting

It was announced that the next meeting of the Commission would be held by courtesy of ICI, Ltd., at Jealott's Hill, UK, from 21–25 August 1972.

Appendix I: Terminal Residues of Chlordane

[*Note.* In this paper chlordane isomers were named according to Nomenclature System 1 as stated in the minutes of the Fifth Meeting of this Commission.]

Animal Metabolites of Chlordane. The metabolism of γ -chlordane and isolation of two of its hydrophylic metabolites in rabbits had recently been more fully described by POONAWALLA and KORTE (1) after an earlier condensed disclosure (2). They reported the isolation of two compounds from the urine of rabbits consuming for ten weeks diets containing 14.3 mg of ^{14}C - γ -chlordane. (This dosage approximated 7 mg/kg of body weight and represented 238 ppm in the diet, based upon presumed body weight of 2 kg and daily solid food consumption of 60 g for each rabbit.) One hydrophylic metabolite was identified as 1-hydroxy-2,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene; the structure of the second metabolite, more hydrophylic than the first, was proposed to be the dihydroxy compound in which both the 1- and 2-chlorine atoms of chlordane were replaced by hydroxyl groups. The hydrophylic compounds were not found in subcutaneous or abdominal fat. Lipophilic metabolites in fat reached a plateau approximating the level of chlordane ingestion.

A paper on characterization of oxychlordane reported to the Fifth Meeting of this Commission as being 'in press' had now been published (3).

Residues in Crops Grown in Chlordane-treated Soils. When the characterization of the metabolite oxychlordane was reported, it was stated that oxychlordane was not detected in residues in soil and plants (3). New observations on residues in soils treated with chlordane and on crops grown therein continued to confirm this statement. In a recent study wherein chlordane (among others) was applied at rates up to 20 lb/acre for three years in sugar beet culture, ONSAGER *et al.* (5) report "... no heptachlor epoxide was detected in either soil or beets". While oxychlordane was not specifically mentioned, it must be presumed also to be absent in view of the proximity of its chromatographic response to that of heptachlor epoxide (3).

Oxychlordane likewise was not detected in the residues on other crops or soils treated either with technical chlordane or 95% chlordane. The tests included root, leafy, stalk, and other vegetables; small grains; cucurbits; fruits; and nuts (4).

New information had been obtained on the composition of crop residues likely to result from soil treatments with technical chlordane. The data obtained permitted the estimation of an 'average terminal residue' of chlordane based on two factors for the respective components: frequency of occurrence and concentration level at harvest. Weighted means for the respective compounds gave the following distribution:

Residue	
Constituent	Percentage
Chlordane (approximately equal α - and γ -isomer content)	88
Nonachlor (Δ -trichlorochlordene)	6
Compound 'E' (γ -chlordene—Note 6)	4.5
Heptachlor epoxide	1
Heptachlor	0.5

The 'terminal' stages for chlordane residues from good agricultural practice were generally below 0.1 ppm for the sum of the components.

Quantitation of Chlordane Residues. Further laboratory studies had been reported on the chromatographic characteristics of technical chlordane. BEVENUE and YEO (7) had explored the vapourization and adsorptive properties of chlordane when exposed to water or organic solvent environments. The preferential vapourization of the low retention time components and the disproportionately rapid disappearance of heptachlor through conversion to 1-hydroxychlordene were demonstrated. THOMPSON (8) studied the volatilization of technical chlordane under normal laboratory conditions and reported on the relative constancy of the chromatographic peaks of α - and γ -chlordane in the residues. He proposed the evaluation of chlordane residues by utilization of the chlordane isomer peaks alone, after an adjustment for 'uniform bias' when this method was employed.

Neither of the two foregoing reports had taken note of previous publications of the reports of the IUPAC Commission on Terminal Pesticide Residues.

References

1. N. POONAWALLA and F. KORTE, *J. Agr. Food Chem.* **19**, 467 (1971).
2. Joint FAO-IAEA Division of Atomic Energy in Agriculture, Proceedings of a Panel on Radiosotopes in Detection of Pesticide Residues, Vienna, 1966.
3. P. B. POLEN, M. HESTER and J. BENZIGER, *Bull. Environ. Contam. Toxicol.* **5**, 521 (1970).
4. Velsicol Chemical Corpn., Chicago, Illinois, USA, unpublished reports (1970).
5. J. ONSAGER, H. W. RUSK and L. I. BUTLER, *J. Econ. Entomol.* **63**, 1143 (1970).
6. Compound 'E' [γ -chlordene ($C_{10}H_6Cl_6$)], a constituent of technical chlordane, was identified by the letter designation on a chromatograph—presented as evidence to the First Meeting of the IUPAC Commission on Terminal Pesticide Residues, Vienna, Austria, 1966.
7. A. BEVENUE and C. Y. YEO, *J. Chromatog.* **42**, 45 (1969).
8. D. W. THOMPSON, *J. Assoc. Off. Anal. Chem.* **53**, 1015 (1970).

Appendix II: Terminal Residues of Cyclodiene Insecticides

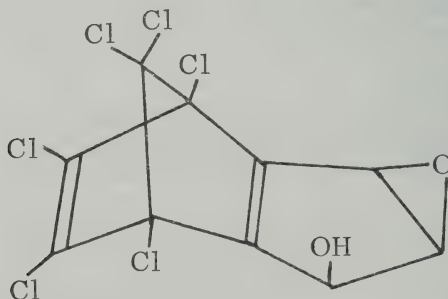
The following sections summarized developments in relation to terminal residues of the cyclodiene insecticides which had occurred since the last review in September 1970.

Transformations in Animals. ODA and MÜLLER (1) administered *trans*-dihydro aldrin diol, a known metabolite of dieldrin, to rats and found one metabolic product to be 4,5,6,7,8,8-hexachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan-1,3-dicarboxylic acid.

BALDWIN and ROBINSON (2) administered ^{14}C -dieldrin to DFE rats and CF1 mice. In both species approximately 90% of the excretion was by way of the faeces. The major metabolite in the faeces was 9-hydroxydieldrin, and *trans*-dihydro aldrin diol was also an important faecal metabolite. The urine of both species contained hexachlorotetrahydromethanoindan-1,3-dicarboxylic acid. The rat urine contained the pentachloro ketone which had previously been described (3), but this was not present in the urine of the mouse.

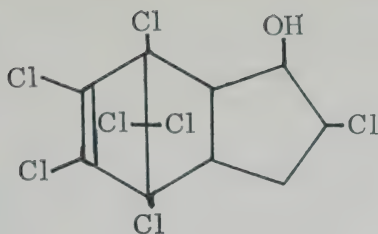
RICHARDSON and ROBINSON (4) examined faeces from personnel with known high dieldrin exposure, and concluded that 9-hydroxydieldrin via the faeces was the chief excretory route of dieldrin injected by man. BALDWIN and ROBINSON (4a) detected 9-hydroxydieldrin as the main metabolite in faeces of Rhesus monkeys and *trans*-dihydro aldrin diol was also an important faecal metabolite.

MATSUMURA and NELSON (5) fed male rats heptachlor epoxide by impregnating their normal diet with a corn oil solution. The feeding level was 10 mg/kg of food for thirty days. They found one major metabolite which they tentatively identified as the structure shown below. They estimated that a rat fed a total of 5 mg of heptachlor epoxide excreted 950 μg of this metabolite.

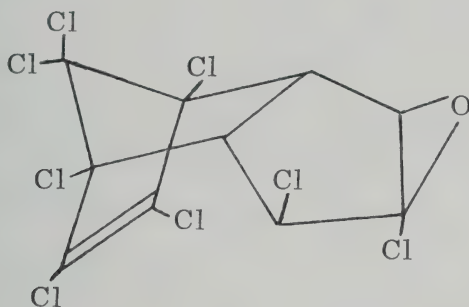


Rat faecal metabolite of heptachlor epoxide

Trans-chlordane was fed to male rabbits by POONAWALLA and KORTE (6). The compound had a high rate of metabolism and excretion in the rabbits and its storage in fatty tissues was small. One metabolite in the urine representing a major excretion form was characterized as the chlorohydrin shown below



Cis- and *trans*-chlordanes were fed to a number of animals (7-9) to characterize a metabolite which had previously been mistaken for heptachlor epoxide. The metabolite was identified as oxychlordanes having the structure



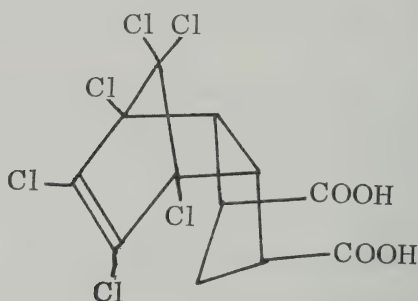
Oxychlordanes was formed in rats, dogs, pigs, and cows. Propensity for storage was low. The ratio of storage level to feeding level was about 0.1 in a thirty-day feeding of chlordanes isomers and approached unity for a chronic two-year feeding. *Cis*-chlordanes appeared to have a slightly smaller propensity for formation and storage of oxychlordanes than did the *trans* isomer.

Transformations in Plants. KORTE *et al.* (10, 11) had reviewed their recent work with the cyclodiene insecticides. Of particular interest this year were their continuing collaborative studies with the Shell Laboratories at Sittingbourne, UK, of the fate of ^{14}C -aldrin in soils and crops after application to soil under practical conditions. Soils in containers were treated in 1969 with 3 kg/hectare of ^{14}C -aldrin in California, Spain, UK, and Germany. Maize was grown in the soil in all countries and wheat, potatoes, and sugar beet were grown in UK and Germany. Seed treatment of wheat was used in addition to soil treatment. Results so far had shown that other metabolites besides dieldrin were present as residues in both plants and soils.

In soils there was no measureable leaching of aldrin or dieldrin, and the greatest amounts of metabolites were in the topsoil (0-10 cm) which had been initially treated. After the growing season (160-180 days) the total ^{14}C of the soils was approximately the same as the initial treatment. In the top 10 cm a typical result showed 0.45 mg/kg of aldrin, 1.07 mg/kg of dieldrin,

0.23 mg/kg of other metabolites, and 0.16 mg/kg of unextractables (measured by combustion). In the 10-20 cm zone total residues of ^{14}C ranged from 0.01 to 0.35 mg/kg with the metabolites ranging from less than 0.01 to 0.04 mg/kg. Lower levels contained successively less, but significant amounts (*ca.* 0.02 mg/l) of ^{14}C in the form of hydrophilic metabolites were present in leaching water which had passed through 50 cm of soil. These metabolites consisted almost entirely of aldrin dicarboxylic acid.

In maize grown in the treated soil, the grain and core contained less than 0.01 mg/kg of total ^{14}C equivalents. Husks and stems contained from 0.03 to 0.08 mg/kg total ^{14}C equivalents with more than 50% in the form of metabolites. Leaves contained the highest residues ranging from 0.05 to 0.35 mg/kg ^{14}C equivalents with more than 80% in the form of metabolites. It was established that about 40% of the total residues in the maize leaves consisted of the aldrin dicarboxylic acid shown below and/or its conjugates. This acid was also found to be an important metabolite in potatoes



Sugar beet contained the highest residues in the peel, 0.05–0.07 mg/kg. About one-fourth to one-third was in the form of metabolites. Peeled beet contained about 0.06 mg/kg of total ^{14}C equivalents with more than 80% as metabolites. The beet leaves were similar to the peeled beet.

Further work was planned. Crops were grown in soils treated in 1969 and 1970 and rotation crops had also been grown without retreatment of the soil in 1970 and 1971.

NASH *et al.* (12–13b) obtained evidence of small amounts of degradation products of dieldrin, endrin, and heptachlor in cotton and soybeans grown in treated soils. Hydroxychlordeane was identified as a metabolite of heptachlor and delta-keto 1,5,3 and the bird cage alcohol were identified as endrin metabolites.

Photochemistry. BENSON (14) studied the photochemistry of dieldrin, providing further evidence for the structure of photodieldrin. Under his conditions (uv light) photodieldrin was further converted to at least two more products.

ZABIK *et al.* (15) found endrin to be cleanly converted by irradiation at 253.7 nm, 300 nm, and in sunlight in cyclohexane or hexane solutions to a pentachloro-half cage ketone compound (1, 8-exo-9,11,11-pentachloropentacyclo [6.2.1.1^{3,8}.0^{2,7}.0^{4,10}] dodecan-5-one). This compound had been found in the field in a muck soil which had been treated with endrin for five years at 2 lb/acre per year. The residue of the ketone constituted about 5% of the total endrin residue which was determined to be 20 ppm.

IVIE and CASIDA (16) studied the sensitized photodegradation of cyclodienes

as well as other pesticides on silica gel chromatoplates and on bean leaves in sunlight. Some differences were observed between the leaves and plates but it was clear that many compounds could sensitize the photochemical transformations. Rotenone and some related substituted 4-chromanones were particularly effective as photosensitizers accelerating the photoalterations of cyclodiene insecticides on bean leaves.

In vitro Experiments and Microorganism Cultures. The work of MATSUMURA *et al.* (17, 18) on degradation of endrin by soil microorganisms had now appeared in the literature. Twenty-five out of 150 isolates from various soil samples were active in degrading endrin. At least seven metabolites were produced.

YU, KIIGEMAGI and TERRIERE (19) found that homogenates of roots of bean and pea seedlings oxidized aldrin to dieldrin and to aldrin diol. They concluded that the dieldrin was not a precursor to aldrin diol, since dieldrin itself was not converted and there was no lag in the production of diol. Apparently the epoxidation and diol formation were separate pathways. The homogenates were not active in epoxidizing heptachlor, but converted isodrin to the endrin ketone (delta-keto 1,5,3).

MATSUMURA *et al.* (20) found photodieldrin among the metabolic products of dieldrin among microorganisms isolated from various environments including soil, water, rat intestines, and rumen contents of a cow.

References

1. J. ODA and W. MÜLLER, Int. Symposium on Chemistry of Pesticides under Metabolic and Environmental Conditions, Bonn, Germany, 8-11 September 1970.
2. M. K. BALDWIN and J. ROBINSON, Shell Group Research Report TLGR.0037.70.
3. A. RICHARDSON, M. BALDWIN and J. ROBINSON, *J. Sci. Food Agric.* **18**, 120 (1968).
4. A. RICHARDSON and J. ROBINSON, *Kenobiotica*, in press.
- 4a. M. K. BALDWIN and J. ROBINSON, Shell Group Research Report TLGR.0022.71.
5. F. MATSUMURA and J. O. NELSON, *Bull. Environ. Contam. Toxicol.* **5**, 489 (1970).
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Appendix III: Chemical Nature of Terminal Residues of Chloropropylate and Chlorobenzilate

Chloropropylate (CP) and chlorobenzilate (CB) labelled with ^{14}C at the acetate moiety were fed to male rats in single doses. The respired carbon dioxide contained 0.14 and 0.67% of the radioactivity evolved from CP and CB, respectively. About 65% of the radioactivity from CP and 43% from CB were found in the faeces. The corresponding values for urine samples were 5.08 and 25.63%. In urine, the radioactive products from CB were excreted more rapidly than those from CP while the reverse was true of radioactivity in faeces. The amounts of activity recovered from brain, heart, spleen, and kidney tissues were generally less than 1% of the total recovery. Recoveries from the liver and gastrointestinal tract were about 8.5% each in the case of CP and 3.31 and 15.47%, respectively, in the case of CB. Identification of the polar metabolic products was under investigation (1).

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Appendix IV: Terminal Residues of Hexachlorobenzene

Residues. (i) In Plants. No residues of HCB were detected in wheat grain, 142 and 295 days after application on summer and winter seed using 2 g/kg of seed of 20% formulation (Biologisches Institut Farbenfabrik Bayer AG, 1967). The analytical methods used were measurement of differentiation extinction in the UV-range (detection limit 0.1 ppm) and GLC (detection limit 0.01 ppm), after extraction with acetone and cleanup with Florisil-benzene.

(ii) In Animals. KOEMAN *et al.* (1) reported within the framework of their investigations on chlorinated biphenyls in fish, mussels, and birds from the river Rhine, the Netherland's coastal area, and Wadden sea that HCB occurred in all places where organisms were collected. They emphasized that HCB was a very inert compound which showed a strong tendency to accumulate in animal tissues.

(iii) In Humans. When analyzing for chlorinated insecticides in human depot fat by GLC, WÜNSCHER and ACKER (2) observed some unknown peaks, most of which were identified later as polychlorinated biphenyls. Another peak was identified as HCB by GLC on two columns of different polarity and mass spectrometry. The same compound was found in human milk. Its concentration in human fat was found to be 6.3 ppm (average of twenty

samples) and in human milk fat 5.3 ppm (average of forty-three samples) [ACKER and SCHULTE (3)]. Continuing the study of serum fatty acids, ZEMAN *et al.* (4) discovered a substance which, by capillary gas chromatography and mass spectrometry, was identified as HCB. As in the studies mentioned above, the authors were not able to decide the source of this substance. It did not seem likely that the widespread distribution in animals and humans was caused merely by the small scale use of the compound in seed dressing practice. Further studies were required to elucidate the source of these residues.

Metabolism. Studies on the metabolic rate of mono-, di-, tri- and tetrachlorobenzene [SMITH, SPENCER and WILLIAMS (5), AZOUS, PARKE and WILLIAMS (6), JONDORF, PARKE and WILLIAMS (7, 8)] suggested that the more chlorine the halogenated benzene contained, the less it was metabolized. This suggestion was confirmed by studies carried out by PARKE and WILLIAMS (9) with rabbits. Hexachlorobenzene did not appear to be metabolized. Five days after oral doses of 0.4 g/kg, the major portion was found in the gut contents, only 6% appearing in the faeces. There was no significant urinary or pulmonary excretion of metabolites. The major part of an injected dose (0.1 g/kg) was found at the site of injection after five days. After application of 0.2 ppm of ^{14}C -HCB to the culture medium of soil microorganisms, no conversion products of HCB could be detected [GEUENICH and KORTE (10)].

Toxicity studies in humans had been carried out by EHRLICHER (11). The workers of a production unit for the chlorination of benzenes were medically supervised over a forty-year period. No serious illnesses or changes of the liver function or the blood composition were observed during that period. Hexachlorobenzene might cause irritations of the skin and the mucous membrane which could be easily avoided. Acute LD_{50} for rats (single dose) 10,000 mg/kg.

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Appendix V: Chemical Nature of Terminal Residues of Carbaryl and Other Carbamates

Carbaryl. The fate of surface residues on bean foliage and fruit had been reported by WIGGINS *et al.* (12). Surface residues were essentially unchanged carbaryl while internal residues were carbaryl (never greater than 5%) and water-soluble glycosides. Aglycones generated enzymatically and chemically from these conjugates were 1-naphthol, 1-naphthyl(hydroxymethyl)carbamate, 4-hydroxycarbaryl, 5-hydroxycarbaryl, 7-hydroxycarbaryl, and 5,6-dihydro-5,6-dihydroxycarbaryl. In mature fruit 1-naphthyl(hydroxymethyl)

carbamate was, as was the case with foliage, the predominant aglycone. The 7-hydroxycarbaryl conjugate had not been previously reported. Mass and UV spectroscopic confirmation of several of these aglycones was now available (11). Wheat metabolites differed in that the 4- and 5-hydroxyaglycones predominated (1). Milk from a cow fed 100 ppm of carbaryl for twenty-eight days gave 3,4-dihydro-3,4-dihydroxycarbaryl, 5,6-dihydro-5,6-dihydroxycarbaryl (a major milk metabolite), 5,6-dihydro-5,6-dihydroxy-1-naphthol, 5-hydroxycarbaryl (conjugate), and an unknown major metabolite. The predominant urinary metabolite was conjugated 1-naphthol as was the case with liver and kidney residues (5).

Carbofuran. When the insecticide was fed to laying hens, concentrations in eggs were too low to allow isolation and identification of metabolites. Identified in liver and gizzard were free and conjugated 3-hydroxycarbofuran, *N*-hydroxymethylcarbofuran, and 3-hydroxy-*N*-(hydroxymethyl)carbofuran. In addition to the above, isolates from excreta included 3-ketocarbofuran, carbofuran phenol, 3-hydroxycarbofuran phenol, and 3-ketocarbofuran phenol (7).

Meobal. The 1970 summary had been augmented by new work of MIYAMOTO (10). New rat metabolites included 3,4-xylenol, its sulfate and glucuronide; the glucuronide of the 3-hydroxymethyl metabolite, and a glucuronide(s) of the corresponding hydroxymethylphenol; the glucuronide of the 4-hydroxymethyl metabolite and a glucuronide(s) of the corresponding hydroxymethylphenol; the *N*-hydroxymethylcarbamate of 4-hydroxy-3-methylbenzoic acid.

Methomyl. *S*-Methyl *N*-[(methylcarbamoyl)oxy]thioacetimidate. This oxime carbamate, applied to cabbage, decomposed to the volatile metabolites acetonitrile, carbon dioxide, and the unesterified oxime. No sulfoxide or sulfone was detected. Radiocarbon was incorporated into normal plant constituents (6). In rats both acetonitrile and carbon dioxide were formed. Urinary metabolites (unidentified) were very polar (2).

Reviews. A review of the metabolism of formetante in plants and animals, covering essentially the work cited in the 1970 report, had been prepared (8). The metabolism of carbamates in animals (4) and in plants (9) had been reviewed. A bibliography including references to radioactive carbamate insecticides and herbicides had been prepared (3).

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Appendix VI: Chemical Nature of Terminal Residues of Organophosphorus Compounds

Diazinon. In soil applications ^{32}P -diazinon was translocated into rice plants where it was converted to insecticidally inactive compounds (3).

Malathion. Rats treated with malathion produced the mono- and dicarboxylic acids as urinary metabolites (6).

Parathion. In addition to following parathion, paraoxon, plasma, and red blood cell cholinesterase in male rhesus monkeys treated intravenously with parathion, a study by CRANMER *et al.* (1) determined urinary diethyl phosphorothioate, diethyl phosphate, and *p*-nitrophenol.

Reviews. The metabolism of organophosphorus compounds had been reviewed (4). Recent information on the metabolic fate of insecticides, including organophosphorus compounds, had been assembled (5). A bibliography of the uses of radiotopes in pesticide investigations included organophosphorus compounds (2).

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Appendix VII: Terminal Residues of Formothion

Formothion, *O,O*-dimethyl-*S*-(*N*-methyl-*N*-formyl-carbamoylmethyl)phosphorodithioate, was the active principle of Anthio, developed by Sandoz Ltd. (Basel, Switzerland). It had insecticidal and acaricidal properties with systemic and contact action against a wide spectrum of sucking, mining, and some chewing insects. It differed from dimethoate in being the formyl derivative. The LD_{50} oral acute for the albino male rat was 365 mg/kg. A gas chromatographic method had been developed for the determination of formothion, dimethoate, *O*-dimethoate, and trimethylphosphorothioate in the technical and formulated product (Sandoz Report 3050/Dr.A.W./Wu. 1971).

Degradation in the Plant. Formothion after topical application to the bean plant had a half-life of less than a day. It degraded first in approximately equal portions to dimethoate and subsequent degradation products on the

one hand and to *O,O*-dimethyl-*S*-(carboxymethyl)phosphorodithioate (F-acid) on the other. The latter was then converted to bis-(*O,O*-dimethyl-phosphorylthiono)disulfide (Disulfide). This was illustrated in Table I following application of labelled material to bean plants—50 μ l of 0.1% ^{14}C -formothion to second leaf stage.

Table I
Residues in % of applied dosage

Time after treatment	Formothion	Dimethoate	F-acid	Total
30 min	75	13	10	98
4 hr	70	17	11	98
6 hr	58	23	15	96

On application of 50 μ l of 0.1% ^{14}C -labelled formothion and dimethoate to bean plants the following distribution of Disulfide and F-acid were found

Table II
Formothion applied metabolism Dimethoate applied metabolism

Time after treatment	Formothion applied metabolism		Dimethoate applied metabolism	
	F-acid	Disulfide	F-acid	Disulfide
2 hr	9.2	n.d.*	n.d.	n.d.
1 day	3.3	2	n.d.	n.d.
2 day	2	3.5	trace	n.d.
4 day	n.d.	1.5	n.d.	n.d.
8 day	n.d.	trace	n.d.	n.d.

*n.d.=non detectable; remainder as % of applied dose.

(Sandoz Report 1970, B. LAROCHE, C. VAN HOEK, D. BASSAND and H. SAUER)

The F-acid and Disulfide were synergists of dimethoate for insects but not for mammals. Although formothion was degraded faster than dimethoate, its residual toxicity to many insects was greater due to this synergistic effect (Sandoz Report September 1970, D. BASSAND and C. KLOTZSCHE).

Degradation in the Mammal. After oral administration of carboxyl ^{14}C -labelled formothion to the rat there was practically quantitative appearance of radioactivity in the urine but no formothion or dimethoate. The metabolites were isolated as *O,O*-dimethyl-*S*-(carboxymethyl)phosphorodithioate (F-acid) and 'polar metabolites'.

Time, hr	F-Acid, %	S.E.,* %	Polar metabolites, %	S.E., %
4	31	4	19	5
8	37	5	33	8
24	43	4	57	4

* S.E.=standard error.

Formothion was rapidly metabolized when administered orally. The 'F-acid' was excreted faster than the 'polar metabolites' with biological half-lives of 4 and 7 hours, respectively. The latter contained the carboxyl group as this was labelled and the losses were very small. It was concluded that there was

no cleavage to glycolic acid as no labelled $^{14}\text{CO}_2$ was found. The question of demethylation or direct cleavage had to be answered (Sandoz Report 1971, H. WAGNER).

Subsequent reabsorption studies following oral administration of ^{14}C -labelled formothion showed the highest initial level in the kidney and liver with much smaller amounts in other organs, muscle, and fat. In two days 98 % of the reactivity was in the urine and 2 % in the faeces, thus indicating rapid reabsorption. This was further illustrated by up to 30 % of the radioactivity during 24 hours being absorbed from the bile (Sandoz Report 1971, F. KALBERER).

A gas chromatographic method could determine formothion, dimethoate, *O*-dimethoate, and trimethylphosphorothioate in technical and formulated products. Using thiometon as an internal standard, amounts to 10 ng were determined at 1-2 % standard deviation with automatic injection and 3-5 % with manual. The Varian Aerograph 1200 gas chromatograph was used with an alkali flame ionization detector. Linearity was obtainable between 1-100 ng (Sandoz Report, 1971).

Residues. The active residues after formothion treatment were formothion, dimethoate, and *O*-dimethoate.

Crop	Application of formothion, %	Sampling days after spraying	Residues, ppm			
			Formothion	Dimethoate	O- Dimethoate	
Sugar beet leaves	0.1	0	0.4	0.4	3.2	4.0
		3	n.d.*		0.5	1.0
		7	n.d.		<0.1	0.2
		10	n.d.		n.d.	
Sugar beet	0.1	0	n.d.			
		3	n.d.			
		7	n.d.			
		10	n.d.	(Sandoz Report NF 1/61)		
Cherries	0.2	0.25 hr	0.4		1.6	
		1	0.2		1.6	
		2	n.d.		1.4	
		8	n.d.		0.3	
		21	n.d.		0.1	
		28	n.d.		n.d.	(Sandoz Report NF 3/64)
Apples	1.2	1	0.25		0.25	n.d.
		1	0.075		0.15	n.d.
		1	n.d.		n.d.	n.d.
(Sandoz Report NF 9/64)						

*n.d.=not detected.

In a few months a final study on formothion would be published (Sandoz—personal communication).

Appendix VIII: Chemical Nature of Terminal Residues of Fumigants

Sorption of Fumigants by Grain. The sorption of fumigants by different species of grain seed of varying moisture content, measured under varying temperature conditions and fumigation chamber loads, was an indirect measure of the residues to be expected in or on such grains immediately after termination of the fumigation exposure period. Ethylene dibromide (EDB) and HCN were nearly completely sorbed (95-99%) from interstitial air in corn and wheat containing 9-15% moisture at 80°F when exposed for 24 hours. The sorption of phosphine and methyl bromide (MB) on grain increased with increasing moisture content and increasing load [VINCENT *et al.* (1)].

Gravity penetration and closed recirculation fumigants were conducted in wheat, corn, and sorghum at 45, 65, and 85°F to investigate (effect of temperature and commodity on) the distribution of two liquid fumigant mixtures, carbon tetrachloride-carbon disulfide ($\text{CCl}_4:\text{CS}_2$, 80:20), and ethylene dichloride-carbon tetrachloride (EDC: CCl_4 , 75:25) used at dosage rates of 3 gallons/1000 bushels. The fumigations were conducted in 5-ft metal towers each containing 2 bushels of grain.

In the gravity fumigations the time required for the passage of a detectable concentration of fumigant through the commodity increased as grain temperature decreased. Penetration time at each temperature tested was least in corn and greatest in sorghum. Concentrations of each component in interstitial air were generally higher in the recirculation fumigation than in the gravity fumigations, particularly at 45°F fumigations. CS_2 was less affected by decreased temperatures or changes in commodity than CCl_4 or EDC. Comparison of the total component concentrations obtained in interstitial air in each commodity fumigation with the total obtained at each fumigation temperature indicated that the high sorption capacity of sorghum was a more limiting distribution factor than the slower rate of volatilization and penetration resulting from fumigation at 45°F in both gravity and recirculation fumigations [STOREY (2)].

Residues of Fumigants in Commodities. Seven lots of commercially-fumigated grains were sampled from storage bins and analyzed for residues of the organic fumigants. The history of fumigation of the bins was as follows:

Sample	Grain	Fumigant used	Fumigated	Dosage, gal./1000 bu.
1	wheat	Weevil-Cide ^a	5/22/70	1.5
2	corn	Weevil-Cide	1/70	2
3	milo	Weevil-Cide	unknown	2
4	wheat	Max Kill 10 ^b	3/30/70	1
5	wheat	Max Kill 10	4/29/70	1
6	wheat	Max Kill 10	4/20/70	1
7	milo	Max Kill 10	2/24/70	1

^aWeevil-Cide contained 82.2% CCl_4 , 16.4% CS_2 , and 1.4% SO_2 (by weight).

^bMax Kill 10 contained 70.5% CCl_4 , 16.5% CS_2 , 6.6% EDB, and 6.4% MeCl_2 (by weight).

Residues were isolated by the acid reflux procedure and determined by GLC. Residue levels in grain sampled 1-3 months after application, ranged from 0.84-2.16 ppm of CS_2 , 2.92-20.4 ppm of CCl_4 , and <0.01-6.10 ppm

of EDB. In general, residue levels found on grains fumigated at different times indicated the tendency for the volatile fumigants to dissipate with time. The lower volatility of EDB resulted in disproportionately high residue compared to CS_2 and CCl_4 , which were applied at higher rates [MCMAHON (3)].

Analytical studies in Israel conducted on three commercial samples of flour, showed residues of 0.2–0.3 ppm of CCl_4 . Crackers appeared to contain about 0.004 ppm of CCl_4 . All eight samples of bread tested were free from detectable CCl_4 (<0.005 ppm) and other fumigants (<0.2 ppm) [BONDI *et al.* (4)].

Papaya, pineapple, Brewster litchi, peppers, and navel oranges were fumigated with EDB variously at 8, 12, 16, 24, 32, and 48 mg/l (oz/1000 cu. ft) for 2 hours at 10, 15, or 21.1°C. These dosages were the minimum, or double the minimum, required by USDA quarantine regulations for eradication of three species of tephritid fruit flies in Hawaiian produce. Residues of EDB in fruits and vegetables were determined analytically 1 and 3 days post-treatment, for EDB (sensitivity about 0.1 ppm) and for total inorganic bromide residues (sensitivity about 0.2 ppm).

Inorganic bromide residues at 3 days posttreatment varied from a trace in papaya and pineapple to 45 ppm in peppers, EDB residues at 3 days posttreatment varied from 0.6 in pineapple pulp to 24 ppm in navel oranges. The rate at which EDB residues decreased in fumigated oranges depended on the temperature during storage. From the slopes of the regression lines based on residues at 2, 4, and 6 days posttreatment half-lives of residues of EDB in navel oranges at 5.6, 11.7, and 18.9°C were estimated to be 2, 1.8, and 1.3 days, respectively. Citrus fruits were normally consumed by humans at considerable intervals after treatment with EDB. Papayas dipped in aqueous solutions of EDB at 108.5 or 144.7 mg/l for 20 min at 43–48°C, and stored at 19–27°C for 3 days, contained 0.1 ppm of EDB. Inorganic bromide residues were below 10 ppm [STEO *et al.* (5)].

Alfalfa and timothy hay bales were fumigated for quarantine purposes with 2–6.5 lb/1000 ft³ of methyl bromide (MB) at temperatures from 10–>70°F and exposure periods of 3–4 hours. Inorganic bromide residues ranged from <2 –34 ppm. Untreated bales showed a natural bromide content of 2–20 ppm [HAYWARD *et al.* (6)].

Analysis of residues of ethylene oxide (EO) introduced as oxirane (15% EO, 85% CO_2) at dosages of 1,125 ml into airtight cellulose film 750-cm bags containing bread, showed conversion of EO to ethylene chlorohydrin (ECH), resulting in an average concentration of 260 ppm of ECH in the bread [MANCHON *et al.* (7)].

The effects of dosage, temperature, moisture content, and conditions of storage on the retention of EO by a range of commodities after exposure to the vapour were studied by SCUDAMORE *et al.* (8) in laboratory tests at treatment levels normal for sterilization and for insect control.

The extent of reaction of EO with inorganic halides and water to form halohydrins and glycols was investigated with reference to amounts of inorganic chloride and bromide present, moisture content, and acidity of the commodity, and storage temperature. Residual compounds were determined by GLC of acetone-water extracts during a period of up to a year after treatment. When commodities were kept at 25°C, either under airtight storage conditions or freely aired, residual ethylene oxide usually fell to below 1 ppm within 14 days, but in flour kept under air-tight conditions after treatment at sterilization level, 50–100 ppm remained at 14 days and traces were found after 90 days. At lower temperatures EO disappeared more slowly.

Levels of EO produced during and after exposure to EO ranged from zero

in groundnuts and cocoa beans at fumigation dosage to thousands of parts per million in sterilized curry powder and turmeric.

ECH, ethylene bromohydrin (EBH), ethylene glycol, and diethylene glycol persisted in some commodities after treatment, but the halohydrins disappeared from finely divided products under the influence of air movement and EBH slowly decomposed under sealed conditions.

In the preparation of baked and steamed products from flour containing ECH and EBH, 20-100% of the original residue was lost, depending on the alkalinity of the conditions used.

With the use of high concentrations of EO (5000 mg h/l) many commodities became more alkaline, changing as much as 1 pH unit.

Metabolites of Ethylene Dibromide in Rats. Radioactive ($U^{14}C$) labelled EDB was administered by stomach tube to rats at 120 mg/kg, then sacrificed after 4 hours and the liver studied for the reaction of glutathione and EDB *in vitro*. The major metabolite was identified as *S*-(β -hydroxyethyl)glutathione. *S,S*-ethylene bis-glutathione was found in traces. The above two compounds and the sulfoxides of the first were identified also in the liver of rats treated with labelled EDB. *S*-(β -hydroxyethyl)mercapturic acid was identified in the kidney [NACHTOMI (9)]. It was not known whether the above reactions occurred in the gaseous state with plants during fumigation.

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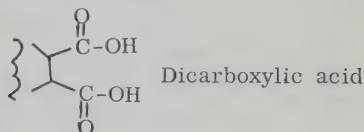
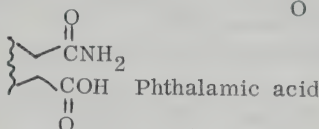
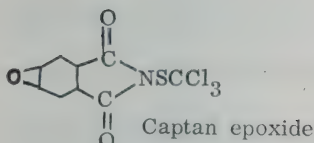
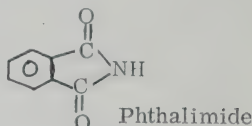
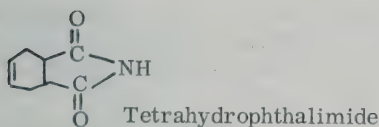
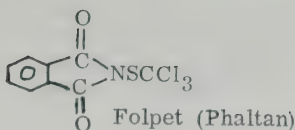
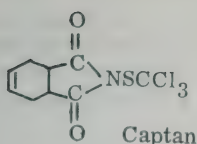
Appendix IX: Terminal Residues of Captan and Folpet

I. Methodology

A. Colorimetric Analyses

1. mostly predate GLC methodology; useful if GLC not available
2. would determine captan and/or folpet; not expected to differentiate between the two
3. four procedures reported (1,2); one was the present official AOAC method
official method (2)
 - surface stripping of firm fruits; blended green vegetables
 - sensitivity: *ca.* 50 μg
 - did not differentiate between captan and folpet

Note. Determination of structure of coloured fusion product (3) showed $-SCCl_3$ group in captan and folpet was responsible for colour reaction with resorcinol; the known imide, -amic acid, and dicarboxylic acid alteration and hydrolysis products from captan and folpet would not be determined by the official method.



B. GLC Analyses

1. preferred determinative step; permitted multiresidue analysis
2. determination of captan residues (apricots, peaches, tomatoes, cottonseed) (4) by maceration of crop and tumble-stripping with benzene (acetonitrile for cottonseed); electron capture detector; as low as 0.01 ppm detection claimed; overall average recovery from fortified samples was 92%; modifications of procedure applied to prunes (5)

Note. This procedure was not developed as a multiresidue method but might be widely applicable

3. determination of captan, folpet, and Difolatan^R in crops (carrots, cabbage, soybeans; some study with spinach, apples, field corn) (6,7) by procedure which paralleled MILLS, ONLEY, GAITHER Method; six food crops fortified at levels of 2.0-0.1 ppm; recoveries generally between 80-110%; XE-60 liquid phase permitted separation of captan from folpet; electron-capture detection after Florisil cleanup; method permitted analysis where previous spray or exposure history of crop was unknown; confirmatory procedures and procedures for detection of structurally related alteration products (GLC, TLC) given (8).

Note 1. CH₂Cl₂-petroleum ether solvent system chosen as partitioning solvent and Florisil elution solvent based on evidence that this solvent mixture was generally useful for pesticides more polar than common organochlorine insecticides; this procedure was aimed towards development of a multiresidue method applicable to a variety of crops and range of pesticide polarities.

Note 2. In an attempted collaborative study of this procedure, some collaborators claimed that the captan response on GLC column was not reproducible; this was presently being studied further; importance of proper column conditioning and column evaluation (7) should be stressed

C. Determination by TLC

1. applicable to captan and folpet in foods; claimed useful for 1-10 ppm on 25-g sample (9); silica gel TLC visualized by Ag^+ spray and UV exposure; lower detection limits claimed: captan, $0.1 \mu\text{g}$ and folpet, $0.15 \mu\text{g}$
2. applied to detection of captan residues in prune fruits and blossoms (10)

D. Confirmatory GLC and TLC

1. using DC-200 and/or mixed QF1 + DC 200 GLC columns (8) for captan or folpet
2. TLC on silica gel with several chromogenic sprays—for captan and folpet (8)
3. GLC and TLC confirmation of captan using NaOCH_3 (sodium methylate solution) treatment of cleanedup crop extract (11)

E. Bioassays and Microbiological Determination

1. use of zebra fish larvae (12); found very sensitive to captan, folpet; was lethal or caused head injury; folpet more toxic than captan (T_{50} folpet = 34 min, T_{50} captan = ca. $2 \times T_{50}$ folpet)
2. use of *Bacillus licheniformis* (13); applied to captan-treated apples
3. use of *Glomerella cingulata* as test fungus for captan analysis (14)

F. Other Instrumental Methods of Analysis

1. by IR, in wines (15); not sensitive, rapid or specific
2. no work on polarographic methods had been reported since 1963 (16)

II. Nature of Residue

A. Reports on Alteration Products from Dicarboxyl Portion of Captan and/or Folpet Molecules

1. imides, phthalamic acids, dicarboxylic acids (17)
2. concept of epoxide formation from captan (8)

Note. Samples of field corn and apples, known to have been captan-treated, were checked by TLC and GLC procedures for captan epoxide; no clear evidence for epoxide was found.

B. Alteration Products from $-\text{SCCl}_3$ Moiety

1. more complex problem than II.A; a range of products containing sulfur in several oxidation states had been reported (18)
2. gases such as COS (carbonyl sulfide) and CSCl_2 (thiophosgene) had been detected (19)
3. reactions of parent molecule or S-containing moiety derived therefrom with purified enzymes, nucleic acids, other sub-cellular components of *S. pastorianus* (20); use of ^{14}C and ^{35}S radioactive labelling; binding of ^{35}S to cellular components found much more extensive than binding of ^{14}C

4. the product of reaction of CSCl_2 with cysteine (an amino acid) (19b) and reactions with thiols (21)

Note. Both captan and folpet had been prepared with ^{35}S labels and ^{14}C -folpet had been prepared; the manufacturers of captan were doing a detailed metabolism study with ^{14}C and ^{35}S labelled captan

III. Toxicity

A. Recent Findings

1. captan found more toxic when test animals were previously fed protein-deficient diet (22)
2. 100 day LD_{50} data for captan had recently appeared (23)
3. effects of captan fed to rats whose diet protein level was varied, were reported (24)
4. mutagenicity studies reported (25)
5. teratogenicity studies reported (26)

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COMMISSION ON PESTICIDE RESIDUE ANALYSIS (VI.5.2)

18-19 July 1971

Present: Dr. R. A. E. GALLEY (Chairman), Dr. D. C. ABBOTT (Secretary), Mr. J. W. COOK, Dr. H. FREHSE, Dr. H. HURTIG, Dr. C. RESNICK, Prof. G. WIDMARK (Titular Members); Mr. W. BURNS BROWN, Mr. K. E. ELGAR, Dr. K. A. MCCULLY (Associate Members).

1. Agenda

Dr. GALLEY welcomed Members and Visitors to the meeting and moved the adoption of the agenda; with two minor alterations this was agreed.

2. Minutes of Last Meeting

The Chairman referred to the minutes of the Fifth Meeting, held on 16-17 September 1970, which had been circulated previously; with a few corrections which were indicated, the minutes were agreed.

3. Matters Arising from Minutes

Arising from the minutes the following matters were referred to:

- (i) The Chairman reported that the minutes of the Fifth Meeting had been published in *Information Bulletin* No. 40 (June 1971) and a summary was in press in *J. Assoc. Off. Anal. Chem.*
- (ii) Minute 6(a). The recommendations on multiresidue methods for organophosphorus pesticide residues had been endorsed by the 1970 FAO-WHO Joint Meeting (JMPR).
- (iii) Minute 6(c). The paper by BOWMAN *et al.* had been published in *J. Assoc. Off. Anal. Chem.*, **54**, 346 (1971).
- (iv) Minute 6(e). The paper on dichlorvos residues had been published by K. E. ELGAR *et al.*, *Analyst* **95**, 875 (1970).
- (v) Minute 10(a). The Secretary reported that he had endeavoured to obtain a report of the COMECON Symposium on Dithiocarbamates held in Dubrovnik in October 1970. Some relevant publications by ENGST *et al.* had been received from Dr. BATORA and passed to the Terminal Residues Commission. There had been little of interest to the Pesticide Residue Analysis Commission in these papers.
- (vi) Minute 4(a) of the Fourth Meeting in Cortina d'Ampezzo, Appendix I. The paper on the development of the FDA's organochlorine multiresidue methods had been published by J. A. BURKE, *Residue Rev.*, **34**, 59 (1971).

4. International Liaison

- (i) *FAO-WHO*. The draft report of the 1970 JMPR, introduced by Dr. TURTLE, was discussed in so far as it affected the work of the Pesticide Residue Analysis Commission. Indications of the need for further study on a number of compounds had been made and arrangements were made to obtain information on analytical methods for residues of chlormequat, dichlorvos, organotin compounds, and mancozeb. Methods for 2,4,5-T and chlorodioxins were also discussed. The varied status of methods suitable for registration, regulatory and referee purposes was discussed, together with the mechanism for advising JMPR on such procedures.
- (ii) *Codex Alimentarius*. Dr. HURTIG introduced the documents received from the Codex Committee on Pesticide Residues, extracts from which had been

circulated to Members. Full discussion ensued and the need to maintain such contacts was stressed. Few comments regarding analytical methods had been submitted by member governments, but many of the compounds at or nearing the end of the Codex procedures would be covered by the multiresidue methods for residues of organochlorine and organophosphorus pesticides already recommended to JMPR by this Commission. The proposed programme for the *ad hoc* meeting due to be held in October was described. The need for some studies on sampling techniques as applied to pesticide residue analysis was also raised.

(iii) *CEE*. A number of methods of analysis had been received from Dr. DORMAL VAN DEN BRUEL with a request for comments by the Commission. Several of the compounds (binapacryl, captan, folpet, carbaryl, lindane, malathion, parathion, parathion-methyl, toxaphene, and TEPP) would be considered further under later agenda items. Members with special expertise or experience in methods for determining these and some other compounds (amitrol, atrazine, diallate, aramite, and barban) were asked to send comments on the indicated procedures to the Secretary for collation and transmission to the CEE Committee on Analytical Methods for Pesticide Residues. It was agreed that the Commission's previous recommendations regarding multiresidue methods for organochlorine and organophosphorus pesticides should be brought to the attention of the CEE Committee.

(iv) *OECD*. Dr. HURTIG reported on the meeting of the OECD Sector Group on the Unintended Occurrence of Chemicals in the Environment held in Paris in May 1971. A technical conference was to be held in Germany in December to discuss the recent work of the 'Holden Group', following which decisions on any future programmes would be made. Economic studies on effects of mercury, cadmium, and PCB's were to be made by OECD.

(v) *FAO-IAEA*. Liaison with the Joint FAO-IAEA Division had been discussed in the Terminal Residues Commission meeting; similar lines of communication were endorsed by this Commission.

(vi) *AOAC*. A draft paper containing definitions of the terms 'collaborative study', 'cooperative study', and 'check sample series' had been received from Dr. HOROWITZ for comment. The Secretary would correlate any comments received for transmission to AOAC.

(vii) Some aspects of residue analytical work in Australia were briefly outlined by Dr. I. R. TAYLOR. Dr. HURTIG and Mr. COOK described some check sample procedures and practical 'workshops' conducted in their respective countries.

5. Organochlorine Compounds

(i) Mr. COOK introduced his report (Appendix I) on improvements in multi-residue methods, particularly with respect to polychlorobiphenyls (PCB's) and similar compounds; problems in quantitative aspects were discussed. Tabular information was also presented on the analytical behaviour of a large number of pesticides during the application of AOAC extraction and cleanup methods 211.1, 212.1, 231.1, and 232.1 (*Official Methods of Analysis of AOAC* 11th Edition, 1970) for organochlorine and organophosphorus compounds in fatty and nonfatty foods; this would be published in due course in the *Pesticide Analytical Manual* (PAM, Vol. 1). Mr. COOK agreed to continue to survey this field.

(ii) Copies of a preliminary report on a collaborative study by the Oils and Fats Section of IUPAC on the determination of organochlorine pesticide

residues in soybean oil were received from Dr. HEINERTH, Chairman of the Section. A recommendation had been made for adoption of the MILLS method (*Pesticide Analytical Manual*, Vol. 1) as a multiresidue procedure for organochlorine compounds in crude and refined oils. This decision was noted by the Pesticide Residue Analysis Commission which had recommended at its 1969 meeting in Cortina d'Ampezzo adoption of the MILLS procedure for the determination of organochlorine residues in foodstuffs (*Comptes Rendus XXV Conference*, p. 196). The possibilities of closer collaboration with the Oils and Fats Section in this matter were discussed.

6. Organophosphorus and Carbamate Compounds

(i) A report on progress in multiresidue methods for organophosphorus and carbamate compounds prepared by Mr. STORHERR was introduced by Mr. COOK (Appendix II).

(ii) Dr. ABBOTT described briefly the work of the UK Panel on Malathion and Dichlorvos Residues in Grain. Collaborative work was nearing completion and it was hoped to extend the procedure to cover samples of other foodstuffs and also other organophosphorus pesticide. The procedure examined were based on those of CRISP and TARRANT [*Analyst* 96, 310 (1971)] and ELGAR *et al.* [*Analyst* 95, 875 (1970)].

(iii) Dr. FREHSE's report included comments on progress in analytical procedures for residues of fenitrothion, formothion, and thiometon, following requirements indicated at the 1969 JMPR (Appendix III). Reports on fenithion, omethoate, trichlorfon, and trichloronate had been prepared for the 1971 JMPR and would shortly be made available to the Commission. Five organophosphorus compounds (diazinon, dichlorvos, dimethoate, malathion, and parathion) had been included in the evaluation of the 1970 JMPR but publication of these monographs was still awaited. It was hoped that a fuller review of the subject, including collated data obtained from the 'questionnaires' described at the previous two Commission meetings, could be prepared for discussion at the 1972 Commission meeting.

During these discussions the continuing need for 'special' procedures for individual compounds, together with the multiresidue approach, was endorsed. The usefulness of micro IR and mass spectrometric procedures for positive identification purposes was also stressed. Mr. COOK and Dr. FREHSE agreed to continue to report progress in their respective fields.

7. Organomercurials and Heavy Metals

(i) Prof. WIDMARK presented his report (Appendix IV) together with the associated book entitled *Methyl Mercury in Fish* which contained a chapter of 21 pages dealing with analytical techniques. It was agreed that the present method of choice for total mercury content entailed the use of flameless atomic absorption following an acid digestion process, preferably with nitric-sulphuric acids in an appropriate apparatus to minimize losses by volatilization. For methyl mercury and other organomercury determinations, gas chromatographic procedures based on that of WESTRÖÖ [*Acta Chem. Scand.*, 21, 1790 (1967)] were recommended.

(ii) Dr. ABBOTT outlined work in progress by the UK Panel for the Determination of Traces of Mercury in Foodstuffs; good agreement had been observed during the first check sample study among several laboratories using varying analytical techniques.

(iii) Dr. MARCHART reported that the book on mercury, jointly sponsored

by WHO-FAO-IAEA, was nearing completion and publication was expected at the end of 1971.

(iv) Some other heavy metals (cadmium, lead, copper) were also discussed briefly; it was noted that the Food Additives and Contaminants Commission of the Food Section of IUPAC would be studying methods for copper and cadmium.

8. Fumigants

Mr. BURNS BROWN introduced his report on analytical methods for fumigant residues (Appendix V). Discussion ranged over the effects of various levels of natural bromide content, production of ethylene bromohydrin following ethylene oxide fumigation, and the continuing need for a tolerance level for bromide quite apart from any that may be proposed for organobromine compounds. It was agreed that the nature of the terminal residues, e.g., reaction products with natural constituents, resulting from fumigant treatments warranted further study; the matter would be drawn to the attention of the Terminal Residues Commission. It was also generally agreed that the use of gas chromatographic multiresidue methods for volatile fumigant residues could now be recommended to the 1971 JMPR for consideration.

9. Other Compounds

(i) *Dithiocarbamates*. Dr. RESNICK stated that there was little to report at present but that methods for determination of the degradation products ethylene thiourea and ethylenethiuram monosulphide would be published soon.

(ii) *Rethrins and Synergists*. Dr. MOORE described the possibility of using liquid-liquid chromatographic procedures for pyrethrins and piperonyl butoxide.

(iii) *Ethoxyquin*. Dr. RESNICK described some preliminary work on gas chromatographic procedures for residues of ethoxyquin in apples and pears.

(iv) *Hexachlorobenzene*. Mr. ELGAR's report (Appendix VI) indicated that suitable gas chromatographic procedures were now available for residues of hexachlorobenzene.

(v) *Quintozene*. A summary of methods used to determine quintozone residues was introduced by Mr. ELGAR (Appendix VII). Dr. ABBOTT outlined recent work in UK which would be published in the near future (P. B. BAKER and B. FLAHERTY, *Analyst*, in press).

(vi) *Captan, Folpet, and Difolatan*. A report by Mr. POMERANTZ was introduced by Mr. COOK. This summarized procedures for determining residues of captan, folpet, and difolatan by colorimetric, gas chromatographic, TLC, bioassay, IR, and polarographic methods. It was agreed that gas chromatographic methods [e.g., POMERANTZ *et al.*, *J. Assoc. Off. Anal. Chem.* **53**, 154 (1970)] were now the methods of choice, since the colorimetric procedures did not distinguish between captan and folpet, for which different tolerance levels had been recommended.

(vii) *Binapacryl and Dinocap*. Dr. ABBOTT presented information on a gas chromatographic determination of binapacryl [CASSIL *et al.*, *Residue Rev.*, **26**, 63 (1969)] and a TLC procedure for dinocap residues in cucumbers [SHMIGIDINA and VOLASHCHENKO, *Khimi. Sel. Khoz.* **7**, 918 (1969); *Chem. Abs.* **72**, 131385 p (1970)].

(viii) *Systemic Fungicides*. Dr. RESNICK presented a report on analytical procedures for a number of systemic fungicides. These included the colori-

metric determination of benomyl, UV spectrophotometric methods for ethirimol and dimethirimol, colorimetric procedures based on hydrolysis to aniline for residues of carboxin and oxycarboxin, and a TLC system for determining a number of thiophanates.

(ix) The possibility of a requirement for methods of residues of pentachlorophenol was discussed.

10. Definitions

A discussion took place on the need for definitions of such terms as 'persistence' and 'sensitivity'. It was agreed that this should be taken further at the joint Section-Commissions Meeting on 20 July.

11. Publication

A copy of the minutes of the meeting would be prepared by the Secretary for inclusion in *Comptes Rendus XXVIth Conference*; a summary report would also be prepared for *J. Assoc. Off. Anal. Chem.*

12. Retirement of Chairman

The thanks of the Commission were expressed to Dr. GALLEY, the retiring Chairman, for his valued services. He thanked the Secretary and Members for their hard work and support during his tenure of office.

13. Arrangements for Next Meeting

The next meeting of the Commission would be held by courtesy of ICI Ltd, at Jealott's Hill, UK, from 21-25 August 1972.

Appendix I: Multiresidue Methods of Analysis for Organochlorine Compounds

There had been continued effort to improve various portions of the multi-residue methods for organochlorine compounds. Although the original development was for the purpose of providing a means of analyzing for many pesticide residues at one time, other compounds such as PCB's, chlorodioxins, *etc.*, were measurable by the incorporation of slight changes in the procedure.

Some of the improvements and extensions of the methods for pesticides and other compounds were as follows:

(i) The method reported last year (1) for separating PCB's from DDT and its analogues included conditions for Aroclors 1254 and 1260. This year Aroclors 1221, 1232, 1242, 1248, 1254, 1260, and 1262 had been studied in different segments of the analytical methodology; (a) elution from silicic acid column; (b) partitioning between petroleum ether and acetonitrile; (c) response by the electron capture GLC detector; (d) TLC as described by MULHERN *et al.* (2) Results showed: (a) Aroclors 1221, 1232, 1242, and 1248 divided between the petroleum ether and polar solvent eluates from the silicic acid column. In general those Aroclor components having shorter GLC retention times (and presumably containing less chlorine) had a tendency to be eluted with the organochlorine pesticides. The more widely used Aroclors 1254 and 1260 were separated from the pesticides. (b) Recoveries through the petroleum ether-acetonitrile partitioning (including 'backwash' as described for cleanup of fish by PORTER *et al.* (3) ranged from 94% for Aroclor 1221 to 74% for Aroclor 1262. Recoveries were inversely proportional to chlorine content. Recovery for Aroclor 1254, the most common PCB residue, was 87%. (c) Response by the electron capture GLC detector

was not solely dependent on the amount of chlorine in the PCB molecule. The ratios response/weight of chlorine and response/weight of Aroclor, both increased with increasing chlorine content. (d) The TLC technique was found to be less reliable than GLC for determining PCB. A slight increase in migration distance of the Aroclors was noted with increasing chlorine content. (ii) Determination of residues of PCB's needed improvement. Residues obtained from food products might differ from the commercial PCB's. Electron capture GLC response to commercial PCB's was not in proportion to chlorine content, therefore differences in residue values could result from calculations based on different approaches.

PCB residues were currently determined by FDA as follows: PCBs were detected by electron capture GLC of 6% ethyl ether-petroleum ether Florisil eluate as described in the FDA *Pesticide Analytical Manual*, Vol. I. PCB's were separated from organochlorine pesticides by chromatography on silicic acid (1). In instances of low residues levels, instead of silicic acid chromatography, alkali dehydrochlorination of DDT and TDE might be used prior to measurement of PCB. (GLC peaks of the olefins formed were excluded from the measured area of PCB.) PCB residues were quantitatively verified beyond electron capture GLC, by GLC with halogen specific microcoulometric detection and stability of the residue to alkali reflux. Residues were determined using total area of all residue peaks versus total area of all peaks in appropriate Aroclor reference. The Aroclor with GLC pattern most similar to the residue was chosen as a reference; residues resembling Aroclor 1254 were those most frequently found.

Approximate limits of detection for PCB residues in foods using the FDA methodology were as follows:

Food	Approx. injected wt., mg	Approx. limit of det., ^a mg/kg
Fruits and vegetables	20	0.25
Fish (whole)	25-50	0.2-0.1
Milk fat	3	1.5
Milk (whole)	75	0.06

^a Assumed Aroclor 1254 as residue; electron capture response of 10% full-scale deflection for 5 ng of Aroclor 1254 considered minimum detectable quantity.

(iii) The manuscript discussed last year on *Behaviour of Chlorinated Naphthalenes in Analytical Methods for Organochlorine Pesticides and Polychlorinated Biphenyls* had been published (4).

(iv) The study reported last year on the method for removing residues from fish, mammal, and poultry tissues had been successfully tested collaboratively, for six organochlorine pesticides in fish and the results were published (5). The study consisted of three fish samples; two were fortified with pesticides to two levels and a third sample contained incurred residues of *p,p'*-DDE and *p,p'*-TDE. Eight laboratories participated. Average results for both fortified levels were: α -BHC, $92.2 \pm 14.9\%$; heptachlor epoxide, $91.6 \pm 8.8\%$; *p,p'*-DDE, $87.5 \pm 13.5\%$; *p,p'*-TDE, $88.6 \pm 11.4\%$; *p,p'*-DDT, $90.6 \pm 9.7\%$; and dieldrin, $82.2 \pm 25.4\%$.

(v) Efficiency of extraction of root-absorbed residues was studied using carrots grown in soils treated at two levels of dieldrin and DDT. Carrots and their tops were each extracted with the methanol-chloroform Soxhlet procedure and by blending with acetonitrile as used in FDA multiresidue methodology. Residue amounts of both pesticides determined after acetonitrile blending were in agreement with amounts extracted by the exhaustive

procedure. This was in contrast to earlier findings with potatoes in which only 55-70 % of a root-absorbed residue of dieldrin was obtained by blending with acetonitrile.

A procedure for cleanup of up to 15 g of fat or oil was being studied which might permit a limit of detectability (electron capture GLC, PAM standard conditions) of approximately 0.005 mg/kg (heptachlor epoxide) in the fat. Partitioning column chromatography had been modified and combined with Florisil column chromatography using eluting mixtures of methylene chloride, hexane, and acetonitrile.

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Appendix II: Multiresidue Methods of Analysis for Organophosphorus and Carbamate Compounds

At last year's meeting, consideration was given to two multiresidue methods (1,2). The former described methods for residues in total diet samples (1) while the procedure of STORHERR *et al.* (2) was limited to nonfatty foods. Both methods presented data on the recovery of many pesticides and their alteration products. The method of STORHERR *et al.* (2) had successfully passed an intralaboratory test and now awaited a full collaborative study. The two-dimensional TLC-cholinesterase inhibition detection procedure described last year had been published (3). It was excellent for confirming GLC results especially on nonfatty foods using the cleanup method of STORHERR *et al.* (2).

Work on the development of methodology for the carbamate insecticides was proceeding well using the same type of acetonitrile extract with subsequent charcoal column cleanup as just described for the organophosphorus pesticides (2). Detection was by GLC at a lower column temperature of 170°C using either a thermionic detector (4,5) or COULSON's electrolytic conductivity detector (6,7) in the reductive mode for nitrogen (as NH_3). At this lower column temperature of 170°C carbaryl was observed to be the parent carbamate having the longest retention time (compared to diazinon as 1.00). The other carbamates tested (carbofuran, Landrin, methomyl, propoxur) were found to elute from the GLC column with retention times ranging between the solvent peak and carbaryl. Aldicarb, however, eluted too quickly even at 170°C. The recoveries of the carbamates ranged from 46 to 80%; these were poor (with pure standards — no crop) not because of the cleanup method but due to the final concentration step using either the KUDERNA-DANISH apparatus with steam or a rotary vacuum evaporator at 55-60°C. Apparently the carbamates were much more susceptible to heat than either the organochlorine or the organophosphorus pesticides. A TLC-cholinesterase inhibition detection procedure had been developed by GARLNER (unpublished) for these several carbamates using the cleanup method of STORHERR *et al.* (2).

Discussion. The multiresidue methodology for pesticides appeared to be well developed for the organochlorine pesticides, developed but not collaborated

for the organophosphorus pesticides, and just now off to a good start for the carbamates.

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Appendix III: Organophosphorus Compounds

Fenitrothion. Besides the possibilities outlined in the 1969 Evaluations of the Joint Meeting, another suitable extraction and cleanup procedure was that described by WATTS *et al.* (1). Analysis of kale samples by this method gave a recovery of 90% at a level of 0.1 mg/kg of fenitrothion. WATTS and STORHERR (2) listed three gas-chromatographic columns for determining fenitrothion, using a thermionic detector. All these columns measured 6 ft \times 4 mm. i.d. The liquid phases were coated on 80-100 mesh Gas Chrom Q: (a) 10% DC-200, retention time of 3.9 min at 200°C (3.75 min at 220°C); 3.5 ng (1 ng) for 50% FSD.

(b) 10% DC-200 and 15% QF-1 (separate packings), retention time of 5.75 min at 200°C (6.9 min at 220°C); 6 ng (3 ng) for 50% FSD.

(c) 2% DEGS (stabilized), retention time of 3.9 min at 210°C; 2 ng for 30 to 50% FSD.

With this varied range of possibilities there ought to be no difficulty in satisfying the requirements that had to be met by a regulatory method. Fenitrothion could also be determined by the method of ABBOTT *et al.* (3); however, the authors did not state which of the four columns they used was considered to be the most suitable one for this compound.

Formothion. Possibilities for performing a gas-chromatographic determination of this compound, which the Joint Meeting had declared to be desirable, were now known. BÄUMLER and RIPPSTEIN (4) described a method for determining formothion, dimethoate, and omethoate in cherries. The residues were analyzed by GLC on a column of 5% silicone oil on 80-100 mesh Chromosorb G (AW-DMCS) operated at 190°C, using nitrogen as carrier gas and a halogen-P detector. The retention times were 11, 7.75, and 5.6 min, respectively. Recoveries of 0.3 mg/kg were 75-90% for formothion, 95-100% for dimethoate. The presence of these insecticides could also be confirmed by TLC on Kieselgel G with toluene-hexane-acetone (1:2:4).

Formothion, dimethoate, and omethoate could be determined also by the method of ABBOTT *et al.* (3) (see, however, the remark above in the section on fenitrothion).

Thiometon. According to information received from Sandoz AG, no new studies on residue analysis had been performed recently. Thiometon and its primary metabolites could possibly be determined by the method of ABBOTT *et al.* (3).

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Appendix IV: Organomercury Residue Analysis

In two previous reports (1,2) the Residue Analysis Commission had considered methods of analysis for mercury pesticides. It was still considered that the analytical methods referred to in these reports were very well fitted for the determination of pesticide residues in agricultural products and in food at sufficiently low levels of concentration. However, during the past few years public interest in environmental aspects of the presence of mercury in nature had increased. This interest required indirectly very specific types of mercury analysis, some of them not yet available.

Schemes were known whereby methyl mercury compounds could be formed from other forms of mercury available. Differentiation of organic materials of different sources would obviously demand very qualified methods of analysis. However, biological methylation of different types could give rise to complications in interpretation of the mercury analytical data. The lower levels of mercury which could undergo biological methylation and accumulation were not yet established. Thus, the capabilities of the present method of mercury analysis would be exceeded in some types of environmental study.

The possible presence of methyl mercury compounds of natural origin in food was a confusing source of analytical complication. In order to give the broadest possible background for an analytical discussion, it was decided to confine this year's report to consist only of the recent publication *Methyl Mercury in Fish* [Nordisk hygienisk tidskrift, Supplementum 4 (1971)]. This report of 364 pages had recently been published and had the subtitle *A Toxicologic-Epidemiologic Evaluation of the Risks; Report from an Expert Group*.

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Appendix V: Analytical Methods for Fumigant Residues

There was little to report on new analytical methods for fumigant residues. A number of important investigations into the nature and amount of fumigant residues had been reported providing evidence on the acceptability and reliability of the analytical methods employed. The authors had described many minor modifications of techniques designed to improve sensitivity, selectivity, and accuracy.

Bromide Residues. The existence of nationally and internationally recommended tolerance levels for bromide in foodstuffs fumigated with brominated compounds continued to stimulate interest in analytical method. A number of workers had preferred oxygen combustion to the alkaline fusion procedure in the examination of foods for bromide residues. Dow (1) ashed samples of wheat, flour, dried milk, and pecans in a modified SCHÖNIGER oxygen flask and determined bromine by a titration method or by spectrophotometric determination of liberated iodine; collaborative studies yielded satisfactory results. KRETZSCHMANN and ENGST (2) determined bromine residues in 500-mg samples by oxygen flask combustion and the use of a phenol red spectrophotometric method (3) in which the bromide was measured as

bromophenol blue; the bromide losses encountered with wet ashing (4) were avoided. Residues of 5-100 mg/kg of bromide ion were determined with errors within $\pm 2\%$ for replicate determinations. GUTSCHE, HERMANN and RUEDIGER (5) described a flame spectrometric method for the analysis of residues of bromide in cocoa which they claimed to be simple and quick. SHUEZ, YOUNGS and GETZENDANER (6) in a study of the residues of bromide in flour streams milled from fumigated wheats employed the X-ray fluorescence method of GETZENDANER (7,8). HEUSER, GOODSHIP and SCUDAMORE (9) briefly report good agreement in results obtained on samples of cashew nuts by determining total bromide after ashing and by a method in which samples were treated with ethylene oxide to convert ionized bromide to the bromohydrin which was determined by gas chromatography (10).

Residues Arising from Ethylene Oxide Treatments. An extensive investigation of these residues was reported by SCUDAMORE and HEUSER (11) who determined ethylene oxide, ethylene chlorohydrin, ethylene bromohydrin, ethylene glycol, and diethylene glycol in a range of commodities treated with ethylene oxide at fumigation and at sterilization levels of dosage and then stored under various controlled conditions. Full details were given of the analytical methods which were briefly described last year. In general the volatile residues were extracted by a cold 5:1 acetone-water solvent mixture from the ground or finely chopped sample and determined by gas chromatography. Some variation in the choice of column and other operating conditions was adopted to obtain optimum performance and sensitivity in the determination of certain compounds in particular commodities. The percentage extraction of residues from the commodities was determined.

WEINBERGER (12) described a cosweep distillation method for removing and concentrating trace amounts of ethylene chlorohydrin from a variety of materials including fabrics and cellulose-type materials after sterilization with ethylene oxide. The chlorohydrin was determined by gas chromatography. SPITZ and WEINBERGER (13) extended the method to determine ethylene oxide, ethylene chlorohydrin, and ethylene glycol.

BUQUET and MANCHON (14) used gas chromatography to determine ethylene oxide and ethylene chlorohydrin in packaged bread preserved by treatment with ethylene oxide-carbon dioxide mixtures. Dichloroethane could also have been determined but was not found in the samples.

STIJVE (15) examined a variety of foods treated with ethylene oxide for ethylene chlorohydrin and ethylene by gas chromatography of aqueous distillates. He used TLC to confirm the presence of ethylene chlorohydrin in the distillates after its conversion to ethanolamine by reaction with ammonia. However, other compounds, notably ethylene oxide and ethylene bromohydrin, also converted to ethanolamine by this treatment.

BAKER *et al.* (15) described the application of photoelectron spectrometry to the analysis of hydroxy- and halo-alkanes and halohydrins and concluded that the spectra of the compounds examined were sufficiently different to form the basis of qualitative identification.

Residues from Use of Phosphine Fumigants. DISNEY and FOWLER (17) presented a progress report on their investigation into the residues in grain fumigated with ^{32}P -labelled phosphine. The initial concentration of phosphine was determined chemically, a known volume of gas being bubbled through a 1.5% mercury(II) chloride solution and the acidity titrated with sodium hydroxide. Radioactivity in these samples was determined after dissolving the phosphine-mercury(II) chloride complex by oxidation with bromine water containing acidified phosphate as carrier, the bromine being sub-

sequently dispersed by heating. The CERENKOV radiation from these clear solutions was counted in a liquid scintillation spectrometer. For the determination of activity in aired samples of fumigated grain, 2-g aliquots were digested with nitric acid and ammonium nitrate until colourless. After cooling, the melt was dissolved in acidified phosphate carrier and the CERENKOV radiation counted as before.

Multiresidue Methods for Volatile Fumigant Residues. Simple cold solvent extraction methods, such as the acetone-water or the acetonitrile-water procedures of HEUSER and SCUDAMORE (18), which often allowed determination by gas chromatography with little or no further cleanup, might be less sensitive than a method such as steam distillation-solvent extraction which provided a considerable concentration of the residue in the final extract. However, the latter method could be unsuitable for heat labile or easily hydrolysed residues. HEUSER (19) proposed extraction with a cold aqueous solution of dimethyl sulphoxide (DMSO), diluting with ammonium sulphate solution, then partitioning against volumes of diisopropyl ether or toluene ranging from 2.5% of the total volume of the aqueous phase. Lipophilic fumigant residues, such as ethylene dichloride, ethylene dibromide, and carbon tetrachloride, were effectively transferred into the ether or toluene layer. A concentration factor over the original DMSO extracts of up to 20:1 was obtained.

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Appendix VI: Hexachlorobenzene

Work some years ago (1,2) showed that hexachlorobenzene (HCB) was difficult to separate by GLC from the more volatile organochlorine insecticides, such as the isomers of BHC, and fungicides, such as quintozene. More recently, several groups of workers had found that the use of selected polar

GLC stationary phases could give useful separations. Thus, SIMMONDS and TATTON (3) obtained a clear separation of HCB from the α -, β - and γ -isomers of BHC using the cyano-silicone phase GE-XE 60, where the dimethyl siloxane SE 52 and the hydrocarbon Apiezon L did not give adequate separation. KILGORE and WHITE (4) had shown that the fluorosilicone phase QF1 could separate HCB from quintozone (although not from α -HBC) and that this phase resolved many of the chlorinated fungicides. TAYLOR (5) studied the separation of HCB from α -BHC and lindane on a fluorosilicone-polyester mixed phase with a view to resolving this and two other difficult pairs of pesticides, namely, dieldrin and DDE, and TDE and DDT. He concluded that a phase consisting of 2% of QF1 + 2% of NPGS gave good separation of all three pairs and was suitable for routine analysis of HCB residues. In a further publication (6) in which a complete scheme for the analysis of HCB residues in grain was investigated, the polyester phase polypropyleneglycol adipate (Reoplex 400) was chosen. This phase gave clear resolution of HCB from α -BHC and other isomers of BHC but it was not suitable for the separation of other pairs of pesticides which were difficult to resolve. The whole procedure, which consisted of extraction with hexane, cleanup by steam distillation, and analysis by electron capture GLC with a column containing 5% of PPGA on Gas Chrom Q at 190°C, appeared to represent a satisfactory method of analysis for HCB in grain. Other methods of extraction (7,8,9) gave acceptable recoveries of HCB from eggs, butterfat, and meatfat.

KOVACS (10) and THOMAS *et al.* (11) had shown that HCB could be separated from isomers of BHC and from quintozone and other chlorinated fungicides by TLC, so that this technique might be used to confirm the presence of HCB residues.

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Appendix VII: Quintozone

Early work on colorimetric (1,2), polarographic (3), and microcoulometric GLC methods was compared by KLEIN and GAJAN (4). The evaluation of GLC for the analysis of chlorinated pesticides (5,6) showed that with non-polar GLC stationary phases and a mixed polar and nonpolar phase the resolution of quintozone from other fairly volatile insecticides and fungicides was not sufficient for the satisfactory analysis of quintozone residues. GORBACH and WAGNER (7) used microcoulometric GLC with a nonpolar stationary phase for the analysis of quintozone in potatoes after a benzene-isopropanol

extraction and no subsequent cleanup. The presence of two metabolites was indicated, one of which was identified as pentachloroaniline. METHRATTA *et al.* (8) made use of the more sensitive electron capture GLC on several crops, again using a nonpolar stationary phase. They used hexane as the extraction solvent for crops and column chromatography with silica gel as adsorbent and hexane as eluent for cleanup. KILGORE and WHITE (9) had shown that adequate resolution of quintozone from other chlorinated fungicides could be secured on a polar stationary phase, the fluorosilicone QF1. The isomers of BHC were not included in this study, but probably they would have interfered with the determination of quintozone.

Summarizing, it would appear that using established methods, *e.g.*, MILLS *et al.* (10) or LANGLOIS *et al.* (11), adequate efficiency of extraction of quintozone residues could be secured and crop interference removed. It would be necessary to use a selected polar GLC stationary phase in the final determination. However, an investigation which linked together these procedures into a satisfactory scheme for the analysis of quintozone residues had not yet been published.

Quintozone could be separated by TLC from those chlorinated pesticides which were most likely to interfere with analysis by GLC and thus residues could be confirmed by TLC (12,13).

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SECTION ON ORGANIC COATINGS (VI.6)

16-19 July 1971

Present: Mr. P. H. FINK-JENSEN (Chairman), Mr. A. TOUSSAINT (Secretary), Mr. M. A. GLASER, Dr. J. A. W. VAN LAAR, Dr. L. A. O'NEILL, Prof. D. PAGANI (Titular Members).

1. Minutes of Last Meeting

The minutes of the meeting in Copenhagen on 10-11 September 1970 (see *Information Bulletin* No. 40, June 1971, p. 18) were accepted without comment. The progress of the Sections' activities since 1969 was briefly summarized by Mr. FINK-JENSEN. This had been recorded in a letter to the Division President, Dr. GALLAY, in May 1971.

Owing to the limited number of Members present in Washington and to the uncertainty of the future of the Section, only a few items were discussed and decisions taken concerning its activities. The greatest part of the time was devoted to discussions in joint meetings to preserve the existence of the Section.

2. Analytical Sub-Committee

The French translation of the English text for *Alkyd Resins Analysis* had now been completed. Both texts would be submitted for publication.

Dr. O'NEILL was now preparing a report on *Acrylic Resin Analysis*. Members were asked to forward to him their results on the analysis of four polyurethane samples as soon as possible and at the latest by October.

3. Symposium

The organization of the symposium would be done by Dr. BULT (TNO-Delft). In addition to the earlier suggestion of *Water Vapour Transmission through Paint Films* and considering the general trends in the industry, another theme *Air Pollution Problems in the Paint Industry* was also considered possible.

4. Adhesion

Dr. VAN LAAR presented and gave an oral English translation of a German letter from Dr. OESTERLE to Prof. HAMANN (30 May 1971). He asked if this letter, as it was the last opinion on this subject, should have priority over the decisions made at the meeting in Cortina d'Ampezzo (1969). Members were of the opinion that the Cortina minutes should have priority and that it was time to put an end to that work. In addition, if the suggestions of Dr. OESTERLE were followed the book would become too large but these suggestions should be made use of if possible. Members were earnestly asked to provide Dr. VAN LAAR with all documents (books, photocopies of papers, etc.) that they thought might be useful.

It should be remembered that any photocopying expenses incurred might be sent to the Secretary and that they could at least this year be paid from the administrative expenses budgeted for the Section. Furthermore, photocopies could also be made by the IUPAC Secretariat.

5. September Meeting in London

Because of the importance of the decisions to be taken regarding the future and the existence of the Section and the contacts undertaken with FSPT, it was decided that another meeting should be held in the immediate future.

However, the answers from the Members concerning the month of September showed that no dates in that month suited everybody. Since it was planned during the next meeting to have contacts with representatives of FSPT, SLF, OCCA, and FATIPEC, it was highly desirable to have the greatest number of Members present. It would, therefore, appear better to postpone the meeting until somewhat later in the year. Further details would be circulated in due course.

6. Membership

Owing to the present uncertain situation, Members were unanimous in their wish to retain the existing Chairman and Secretary. The periods of Titular Membership of Mr. FINK-JENSEN, Dr. VAN LAAR, and Dr. O'NEILL were extended for two more years. New Titular Members nominated were: Dr. F. H. DE LA COURT (Netherlands), Mr. A. R. H. TAWN (UK), and Dr. U. ZORLL (Germany). The following were nominated as new Associate Members: Mr. M. A. GLASER (USA), Prof. K. HAMANN (Germany), Prof. P. PAGANI (Italy).

Other names had been proposed by IUPAC National Adhering Organizations but no decisions were taken about their election because of the uncertain future.

7. Structural Changes in Applied Chemistry Division

Mr. FINK-JENSEN read out a letter from the Division President, Dr. GALLAY (29 April 1971) entitled *Recommendations to the Bureau and its Executive Committee*, in which it was stated that "Since it is impracticable to extend the present Divisional Structure to cover even a proportion of the important chemical technologies, it was deemed advisable to concentrate in certain well defined areas. Problems relating directly to human welfare seemed a logical direction in which to concentrate." This resolution was dated 14-15 June 1970 from the Frankfurt meeting of the *ad hoc* Committee on Applied Chemistry appointed by the Union.

Following these recommendations the following Sections were envisaged as remaining in the Applied Chemistry Division (which might subsequently change its title): Food, Fermentation Industries, Oils and Fats, Air Quality (replacing Toxicology and Industrial Hygiene), Pesticides, and Water Quality (replacing Water, Sewage, and Industrial Waste).

Nevertheless, these Sections should cover a wider field than at present. On page 3 of the same letter it was written "It is also recommended that the Section on Organic Coatings be shelved indefinitely. Their program has reduced greatly in substance; possibly the Macromolecular Division might be interested in adding this technical field to their responsibilities."

As an answer to Dr. GALLAY a letter was prepared in Washington to the Bureau. In this letter the arguments expressed in Dr. GALLAY's letter were disproved. In addition, the activities of the Section since Cortina d'Ampezzo were briefly summarized. Furthermore, it was emphasized that the contribution of the Section to human welfare could become highly important. Themes like paints for low-cost housing, elimination of pollution solvents, sanitary linings for food containers, *etc.*, could be treated.

In a joint meeting with Section Members and Drs. GALLAY and CAIRNS, it was indicated that IUPAC found the Section too industry-oriented to fit into the general concept of the Applied Chemistry Division as presently envisaged and that it was the wish to integrate appropriate activities of the Section with the Macromolecular Division.

The reply of the Section stated that 40% of its Members were employed directly in industry and 50% belonged to industrial research organizations. The Section was, as shown by its programme (completed and in progress), active and viable. The Section should proceed within IUPAC to the benefit of both the paint industry and of the Union. It fulfilled the important task of bridging the gap between science and industry which was an indispensable function of the Union as stated in its Statutes.

The general opinion of the Members in their replies to a letter from the Chairman (25 May 1971), which everybody except two persons, had answered, was put forward. In the main a unanimous opinion was reached. The Section was composed of very enthusiastic persons and the work done had not only been comprehensive but was also of a high scientific level and of direct use to the industry. Furthermore, it was the general opinion that the Section must remain alive and exist as an entity and that its place was in the Applied Chemistry Division. It also appeared unanimously that, if a change had to take place, it would be preferable to be included in the Macromolecular Division.

It was expressed during the joint meeting that the Members proclaimed their solidarity and joint interest and that the Section must be considered as a whole and as an entity for its pursued aims.

Other arguments had been put forward to preserve the existence of the Section. These were that in USA and in many European countries, the paint field employed a higher number of chemists than any other field, and that the Section was the only worldwide organization in the paint field.

Despite all these arguments, over many hours, the final decision taken by Council was that the activity of the Section as a member body of the Applied Chemistry Division must terminate at the next IUPAC Conference (1973). So there would be an interim period of two years to finalize its work as a Section of the Applied Chemistry Division, it being understood that during this period every effort would be made by the Division, the Section and all concerned to explore other forms of incorporation of the Section, preferably as an entity, within the IUPAC structure. If this was not possible, owing to the excellent contacts the Section enjoyed with FSPT and the encouragement received to pursue its international activities, it might be possible for the Section to operate outside the Union either as an associated group or fully independently. This would give freedom of action if the Section could not be incorporated into a IUPAC Division as a unity and as an entity.

8. Joint Meeting with Macromolecular Division

This meeting at which Members of the Macromolecular Division, Organic Coatings Section, and Pulp, Paper, and Board Section were gathered was suggested by Prof. WICHTERLE who was, unfortunately, absent. The meeting was chaired by Prof. BENOIT, the new President of the Macromolecular Division. No agenda had been prepared. From the discussions it appeared that the Macromolecular Division showed interest in an association with the Organic Coatings Section since the Division felt the necessity of working with problems having an industrial but yet not technological aspect.

However, the Macromolecular Division had not, at least in the near future, the intention to create Sections (it had no Sections at all for the moment). It was, therefore, impossible for the Section to come into that Division as a distinct Section dealing with its own problems. Nevertheless, contacts would be continued between the Macromolecular Division and the Section to see how things might be arranged or to find some *modus vivendi* acceptable to both.

9. Joint Meeting with FSPT

In addition to Members of the Section, the following were present from FSPT: Mr. S. L. DAVIDSON (President), Mr. R. W. MATLACK (Executive Secretary), Mr. J. P. TEAS (President-Elect), Mr. F. K. DANIEL, Mr. C. P. LARSON, Dr. H. C. GERHART. The meeting, originating through letters from Dr. N. P. BECKWITH and Mr. M. A. GLASER of the Section, regarding East European contacts, was arranged during talks in Copenhagen between Mr. DAVIDSON, Mr. MATLACK, and Mr. FINK-JENSEN. The purpose was to determine if suitable cooperation between FSPT (and possibly also other associations) and the Section might be useful.

Mr. FINK-JENSEN first described the scope and the work within the Section, making the point of the internationality of Section Membership and the fact that the problems treated were all international in scope.

Mr. DANIEL then described the scope of the FSPT Liaison Committee. In summary this covered principally:

- to find how to have more contacts with other paint organizations,
- to find original publications from foreign countries and to exchange publications,
- to invite foreign associations to have a correspondent in USA and *vice versa*,
- to include in *Journal of Paint Technology* reports of foreign activities related to the paint field,
- to have in each country a person with the responsibility of arranging contacts and/or visits.
- to invite foreign speakers to the FSPT annual meeting.

It would appear from the discussions with FSPT members that the existing Section network and method of working could become valuable in setting up closer international contact with all branches of the paint field. It appeared also to everybody present that if the Section survived the present crisis, it could become the nucleus for a wider international liaison.

Since the Section intended to have more contact also with OCCA, SLF, and FATIPEC, other tasks than those with which it was now dealing could be undertaken. Such tasks might be:

- worldwide information retrieval,
- joint technical projects of worldwide scope and interest, such as biocides. It also seemed that analytical projects might be a good beginning to such cooperation.
- exchange of technical papers for publication in the paint journals of associated countries.

It had been suggested that in countries where no central, regional or national association existed, the future international Liaison Committee should establish and maintain contact, mainly personal, with prominent paint chemists or scientists in related fields such as resins, pigments, *etc.*

It was decided that the Section would submit these ideas to its Members at a forthcoming meeting. A representative of FSPT, probably Dr. BECKWITH, would attend that meeting.

SECTION ON PULP, PAPER, AND BOARD (VI.7)

15 July 1971

Present: Dr. K. WARD Jr. (Chairman), Dr. C. A. SANKEY (Secretary)—Titular Members.

Attendance at the meeting was drastically reduced in view of the intention to revise the structure of the Applied Chemistry Division with probable suspension of the activities of the Section.

1. Minutes of Previous Meeting

The minutes as published in *Information Bulletin* No. 40 (June 1971, p. 58) were approved with the following corrections:

- (i) p. 61, line 22, change "fibres" to "fabrics";
- (ii) p. 62, line 5, change "Aitkin" to "Aiken";
- (iii) p. 62, line 17, after "Mr. Ellefsen" add "and Prof. Norin";
- (iv) p. 62, section on Nomenclature, *etc.*, line 3, change "space" to "spruce".

2. Recommendations as to Changes in Applied Chemistry Division (Dr. Gally's Memo of 29 April 1971)

In view of the problems in the Division there was little alternative other than to accept the recommendation that the activities of Section VI.7 be suspended although its Members dissented as to the evaluation of the programme which was believed viable (see *Information Bulletin* No. 40, p. 63). The principal concern at the present meeting was to ensure continued support for items presently active and underway.

3. Thesaurus and Keyword Index

A revised thesaurus (edition 1971) containing over 9,000 separate main entries had been published and was available (\$20 Canadian) from the Pulp and Paper Research Institute of Canada. The keyword index was prepared in cooperation with the Institute of Paper Chemistry (Appleton, Wisconsin) and was in agreement with that used in IPC's *Abstract Bulletin*.

TAPPI had published (TIS 019.01) an *Annotated Bibliography of Paper Making Terminology*, including a listing of multilingual dictionaries, which should be of assistance in translation to languages other than English.

4. Nomenclature and Symbols

Dr. TÖPPEL was of the opinion (his letter to Dr. WARD, 28 May 1971) that a collection should be made of designations for materials and testing methods, including those now primarily of historical interest, and also a compilation of test methods in use as national standards. Many of these antedated the issuance of ISO methods while others represented modifications. A survey of ISO methods which were actually used *only* with modifications (and, therefore, not in accordance with the methods as issued) would indicate fields where further work would be desirable.

Such a survey could provide a useful evaluation of progress with ISO methods. On the assumption that the Section was suspended, this activity would also be suspended in the Section's field of interest.

5. Analysis and Testing

Future work in this field would depend on the nature of reorganization of the Applied Chemistry Division.

6. Proposed Symposia

Reference was made to the second paragraph under "6. Proposed Symposia" in *Information Bulletin* No. 40 (p. 60). No further information was available on Finnish-Russian work of pulping of soft-wood wood waste. North American interest was currently limited by cost of collection.

The symposium on Man-made Polymers (June 1972, Helsinki) had been approved for sponsorship by IUPAC. Mr. PALENIUS, of the Section, was very active on the organizing committee. Assuming suspension of the Section, Mr. PALENIUS would lack official IUPAC status. It was believed and urged that some IUPAC status be arranged for him. Dr. WARD would raise this point at the Applied Chemistry Division Committee meeting.

A problem corresponding to the above would not exist for the VIth International Symposium on Carbohydrate Chemistry (August 1972, Madison, Wisconsin) as it was understood that the Organic Chemistry Division was a cosponsor. One day at the Symposium was reserved for polymer science.

The Section's proposal for sponsorship (possibly joint with the Macromolecular Division) was accepted by the Committee responsible for the meeting on non-woven fabrics at the XXIVth IUPAC Congress in Hamburg, 1973 (Dr. W. FRITSCHÉ's letter to Dr. WARD of 12 February 1971). In view, however, of the proposed restructuring of the Applied Chemistry Division, the Section withdrew its proposed sponsorship.

Formal application for IUPAC sponsorship of the IVth Canadian Wood Chemistry Symposium had been filed at the IUPAC Secretariat. It was strongly recommended that this sponsorship be approved on the basis as set out in the application. The symposium committee had modified its proposed programme in accordance with suggestions made at the meeting of the Section in Stockholm in 1970. Perhaps sponsorship could be transferred to the Macromolecular Division. This would be raised at the joint meeting with that Division and Dr. WARD would report to the next Applied Chemistry Division Committee meeting.

7. Membership

The plans as outlined at the Stockholm meeting (*Information Bulletin* No. 40, pp. 61-62) involved immediate replacement to fill two vacancies in the Section. In view of the proposed reorganization these were not approved. For the same reasons other changes in Section Membership were suspended. Suggestions were on record for future Membership which remained valid in the event that the Section was continued.

SECTION ON WATER, SEWAGE, AND INDUSTRIAL WASTE (VI.8)

16-18 July 1971

Present: Dr. S. FREYSCHUSS (Chairman), Mr. B. GÖRANSSON (Secretary), Dr. P. N. J. CHIPPERFIELD, Dr. P. R. L. A. DALQ, Mr. H. PETERS, Prof. K. STUNDL, Prof. W. TESKE (Titular Members).

1. The present situation for water pollution abatement in some groups of industries was surveyed.

Prof. TESKE reported concerning chemical industries that the picture of water pollution methods available and in practice had not changed since the 1970 Congress in Stockholm, where all major questions had been presented and discussed. This was natural since it took an average of five years to develop a treatment process from laboratory experiments to an industrial installation. Areas in which large and unsolved problems remained and in which big efforts were being made, were as follows:

- (i) handling and disposal of sludge,
- (ii) elimination from waste water of organic substances which were resistant to biodegradation,
- (iii) elimination of nitrogen and phosphorus-containing substances which could promote eutrophication,
- (iv) elimination of mercury.

Other matters which attracted attention were the problems involved with cotreatment of sewage and waste water from chemical industries and the problem of characterizing such waste water.

No especially promising approach to solve any of those problems could be seen for the moment.

Dr. FREYSCHUSS reported on progress within the pulp and paper industries. The development and adaptation of internal measures to reduce water pollution had been going extremely fast during recent years and the realization of the totally closed mill was no longer a utopian scheme. New washing methods had made it possible to reduce the loss of cooking liquor to 1-3 kg of BOD₇/ton of pulp. If bleaching was employed, the new processes using oxygen instead of chlorine, made it possible to reuse the backwater for pulpwashing purposes. For the moment it was not possible to exclude chlorine totally from the bleaching process, partly depending on the market's demands on the brightness of the product, partly depending on the difficulties to balance the sodium content of the system. Therefore, the last bleaching stage must be with ClO₂. It was also to be noticed that oxygen bleaching required caustic soda of a quality which could not be produced by the diaphragm process.

Dr. CHIPPERFIELD reported on trends within the food industries. Three main areas of development could be seen:

- (i) More extensive reuse of water which was promoted by the rising price in fresh water in most countries. Reclamation systems usually consisted of high-rate biofiltration followed by trickling filter or activated sludge, then filtering and chlorination.
- (ii) Use of high-rate biofiltration for aerobic digestion of sludge had the advantage over anaerobic fermentation that it was easier to control and gave smaller quantities of sludge.
- (iii) Use of reverse osmosis for concentration and separation. Development of new membranes with acceptable quality and lifetime made this technique more attractive than before.

2. The methods for treatment of waste water were surveyed with the primary aim to develop a programme for a joint symposium in connection with the XXIVth IUPAC Congress (Hamburg, 1973). The following subjects were selected as being especially interesting:

- (i) catalytic oxidation processes in gaseous and liquid phases,
- (ii) liquid-liquid extraction processes,
- (iii) flocculation processes and use of precipitation aids,
- (iv) ion-exchange processes,
- (v) adsorption processes, especially use of activated carbon and polymeric substances in granular form,
- (vi) membrane processes,
- (vii) combined chemical-biological treatment systems.

It was decided that these subjects should constitute the basis for the programme at the symposium in Hamburg. The tentative title should be *Modern Methods for the Treatment of Waste Water in Theory and Practice*. The object should be to present the theory and application of essentially new processes and techniques which had only been put into practice on a limited scale or which were still in the pilot plant stage.

3. Cooperation with other international organizations active in the field of water quality was discussed. It was agreed that the most important of these organizations, outside the UN family, was the International Association on Water Pollution Research (IAWPR) with which cooperation had already been established. The Section should offer its services to IAWPR for the evaluation of papers submitted for presentation at the industrial sections of IAWPR conferences.

Other international and in some cases national organizations, which frequently arranged international meetings on questions relevant to the programme of the Section, should be contacted in an informal way and asked if they were prepared to exchange information about future plans for meetings, etc. Finally, it was recommended that the substantial work of OECD in this field should be followed closely.

4. The urgent need for internationally recognized methods for analysis of waste water was discussed.

Dr. FREYSCHUSS reported on the newly created ISO Technical Committee 147 which was charged with standardization aspects of water purity. The committee would be concerned with such technical questions as terminology, sampling, test methods and methods of analysis, and classification of pollution, but not with the setting of pollution standards. The American National Standards Institute had been entrusted with the Secretariat of the Committee.

It was the opinion of the Section that although there was no reason to doubt the competence and the capacity of the new ISO Technical Committee on water purity, it would still be of great value if the Section had an opportunity to follow closely the development of the work in the Committee. It must also be considered of immediate interest to IUPAC to have the possibility to influence the classification and standardization work where chemistry was involved. One way to arrange the collaboration between ISO and IUPAC was that IUPAC received advanced working papers from the ISO Committee for comment. Another way was that an IUPAC-representative followed the work within the Committee as an observer.

5. The scope of the future working programmes of the Section was discussed. It was agreed that, according to the competence of the Section, it should primarily be concerned with problems in connection with industrial waste water.

6. The disposal of industrial chemical wastes in the sea was discussed. Dr. FREYSCHUSS drew attention to some results of investigations made in the North Sea regarding the effects of dumping chlorinated byproducts from vinyl chloride production. The report was presented at an FAO conference on marine pollution in Rome (December 1970). The investigation showed that although no positive proof of damage on biological life had been observed, traces of the substances could be found in a very wide area of the North Sea and the Atlantic Ocean.

Dr. CHIPPERFIELD pointed out that in most investigations made hitherto, the methods of analysis used had not been specific enough to justify statements about the effects of dumping. It was important that more thorough investigations of the correlation between dumping of specific wastes and their effects in the marine environment were carried out.

The Section decided that the subject of disposal of chemical wastes should be kept under observation by its Members.

7. The Section discussed the question of the relative harm of different substances which could occur in waste water. In recent years attention had been focussed on some substances, such as mercury compounds, phosphates, and chlorinated hydrocarbons, and the demands on waste water treatment with respect to these substances had been sharpened very suddenly. It must be considered desirable to be able to foresee on which substances attention was likely to be focussed next.

It was agreed that the Members should collect, wherever available, listings about the relative harm of substances in waste water.

OPEN MEETING OF APPLIED CHEMISTRY DIVISION

19 July 1971

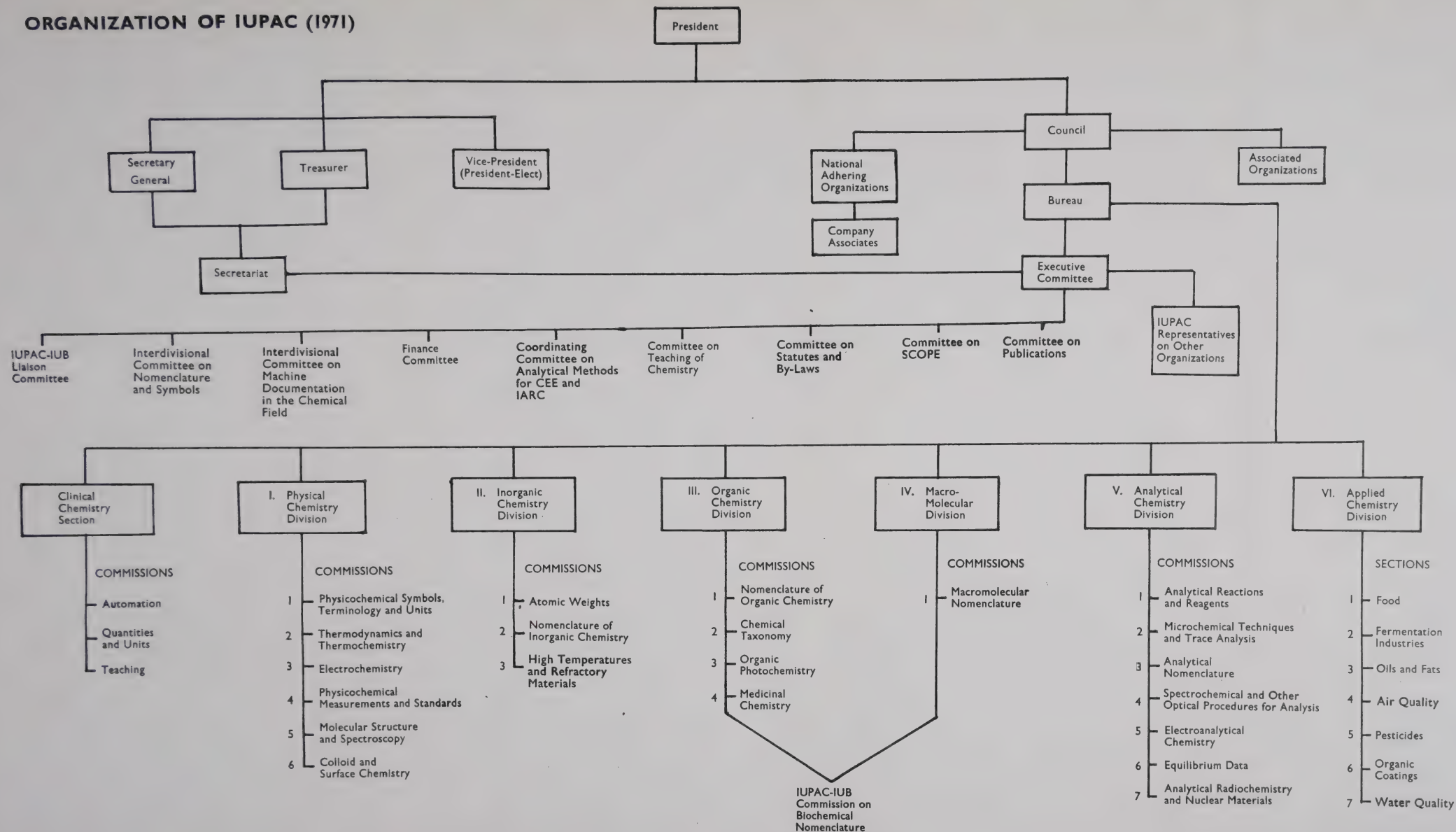
1. The meeting was called to order by Dr. GALLAY, the Division President, who welcomed some thirty people in attendance.

2. Dr. HOSHINO commented on the general success of the Company Associates Scheme of IUPAC. This seemed to be finding favour in a number of countries and assisted IUPAC finances considerably. However, Dr. HOSHINO referred subtly to the fact that industries from the four highly industrialized countries that had provided IUPAC with its current Past-President, Vice-President, Secretary-General, and President of the Applied Chemistry Division, had not yet availed themselves of this fine opportunity.

3. Mr. RATCLIFFE, Mr. LEWIS, and Mr. WALSH of the IUPAC Secretariat, Oxonian Travel Services, and Pan-Am, respectively, pointed out that the use of group travel schemes had saved IUPAC about \$10,000 for the Washington Conference, and urged more participation in such schemes where it was applicable.

4. Dr. GALLAY reviewed the short history and current plans for SCOPE, on which he was the IUPAC representative. He described the various working parties on formulation of a global monitoring system, determination and biological assessment of materials which may significantly affect the biosphere, international registry of chemical compounds, *etc.* He also referred to a UN sponsored conference in Sweden in 1972 in this area. This was expected to produce a number of resolutions that should be adopted by UN member countries. A lively discussion participated in by Drs. HURTIG, RESNICK, GAGE, EGAN, and others followed.

ORGANIZATION OF IUPAC (1971)



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*

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Research Institute for Organic Syntheses
Pardubice-Rybitví (Czechoslovakia)
- 1971–1975 GRAHAM, R. P., Dr.
Department of Chemistry, Gilmour Hall, McMaster University
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- 1967–1975 MASHIKO, Y., Dr.
Government Chemical Industrial Research Institute of Tokyo
Hommach 1-1, Shibuya-ku, Tokyo (Japan)

Associate Members

- 1969– JUHASZ, A., Dr.
Hungarian Main Office of Measurement
Nemetvolgyi út, Budapest (Hungary)
- 1971– LANE, J. E., Dr.
Division of Applied Chemistry, Commonwealth Scientific and
Industrial Research Organization
POB 4331, Melbourne, Victoria (Australia 3001)
- 1969– SIMON, W., Prof.
Laboratorium für Organische Chemie der Eidgenössische
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Universitätstrasse 6-8, CH-8006 Zürich (Switzerland)
- 1971– SMIT, W. M., Dr.
Fysisch Chemisch Instituut TNO
POB 108, Zeist (Netherlands)

- 1967- STAVELEY, L. A. K., Dr.
Inorganic Chemistry Laboratory, University of Oxford
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- 1971- STULL, D. R., Dr.
Dow Chemical Co., 1707 Building
Midland, Michigan 48640 (USA)
- 1969- TERRIEN, J., Dr.
Bureau international des Poids et Mesures
Pavillon de Breteuil, F-92 Sèvres (S.-&-O.) (France)

National Representatives

- Germany*
1965- FEUERBERG, H., Mr.
Bundesanstalt für Materialprüfung
Unter den Eichen 87, D-1000 Berlin 45
- India*
1961- MUKHERJEE, J. N., Dr.
10 Puran Chand Nahar Avenue, Calcutta-13
- Italy*
1953- MILONE, M., Prof.
Chemical Institute, University of Torino
Corso Massimo d'Azeglio 48, Torino
- Poland*
1969- PLEBANSKI, T., Dr.
Division of Physicochemical Metrology, Centralny Urząd
Jakości i Miar
Ul. Elektoralna 2, Warszawa 1
- United Kingdom*
1971- REID, V. W., Dr.
Egham Research Laboratories, Shell Research Ltd.
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I.5 COMMISSION ON MOLECULAR STRUCTURE AND SPECTROSCOPY

Titular Members

Chairman

- 1967–1975 SHEPPARD, N., Prof.
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(TEL: 0603 56161)

Vice-Chairman

- 1965–1973 COLE, A. R. H., Prof.
School of Chemistry, University of Western Australia
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Secretary

- 1967–1975 MILLER, F. A., Prof.
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- 1967–1975 ELYASHÉVICH, M. A., Prof.
Faculty of Physics, Byelorussian State University
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- 1971–1975 FLUCK, E., Prof.
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- 1969–1973 HADNI, A., Prof.
Institut de Physique, Université de Nancy
2 rue de la Craffe, Nancy (France)
- 1965–1973 MORINO, Y., Prof.
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Associate Members

- 1971– FÖRSTER, Th., Prof.
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- 1970– HERZBERG, G., Dr.
Division of Physics, National Research Council of Canada
Ottawa 7, Ontario K1A OR6 (Canada)
- 1971– JEZOWSKA-TRZEBIATOWSKA, B., Prof.
Instytut Chemii, Uniwersytet Wrocławski
Ul. Joliot-Curie 14, Wrocław (Poland)
- 1969– LIPPINCOTT, E. R., Prof.
Department of Chemistry, University of Maryland
College Park, Maryland 20742 (USA)

- 1969– NAGAKURA, S., Prof.
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Azabu, Minato-ku, Tokyo (Japan)
- 1971– RAO, C. N. R., Prof.
Department of Chemistry, Indian Institute of Technology
Kanpur-16, Uttar Pradesh (India)
- 1967– THOMPSON, Prof. Sir HAROLD
St. John's College, Oxford OX1 3JP (UK)
- 1969– TURNER, D. W., Dr.
Physical Chemistry Laboratory, University of Oxford
South Parks Road, Oxford OX1 3QR (UK)

National Representative

- Poland*
1959– URBANSKI, T., Prof.
Chemical Faculty, Politechnika Warszawska
Ul. Koszykowa 75, Warszawa 10

I.5.1 SUB-COMMISSION ON INFRARED AND RAMAN SPECTROSCOPY

Chairman

- 1965- COLE, A. R. H., Prof.
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Nedlands, Western Australia (Australia 6009)
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Members

- 1971- BRODERSEN, S., Prof.
Department of Chemical Physics, University of Aarhus
DK-8000 Aarhus C (Denmark)
- 1965- CRAWFORD, Jr., B. L., Prof.
Department of Chemistry, University of Minnesota
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- 1965- JONES, R. N., Dr.
Division of Chemistry, National Research Council of Canada
Ottawa 7, Ontario K1A 0R6 (Canada)
- 1969- JOSIEN, M. L., Prof.
Laboratoire de Chimie physique du Centre national de la
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2 rue Henri Dunant, F-94 Thiais (France)
- 1965- MILLS, I. M., Prof.
Department of Chemistry, University of Reading
Whiteknights Park, Reading RG6 2AD (UK)
- 1971- WILLIS, H. A., Mr.
Plastics Division, Imperial Chemical Industries Ltd.
POB 6, Bessemer Road, Welwyn Garden City, Hertfordshire (UK)
- 1971- ZERBI, G., Prof.
Istituto di Chimica della Macromolecole
Via A. Corti 12, Milano (Italy)

I.5.2 SUB-COMMISSION ON STORAGE AND RETRIEVAL OF SPECTROSCOPIC DATA

Chairman

- 1963– LIDE, Jr., D. R., Dr.
Office of Standard Reference Data, National Bureau of Standards
US Department of Commerce
Washington, DC 20234 (USA)
(TEL: 301 921 2467)

Members

- 1967– ELYASHÉVICH, M. A., Prof.
Faculty of Physics, Byelorussian State University
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- 1971– FREI, K., Dr.
Research Laboratories, Sandoz AG
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- 1963– SAVITZKY, A., Dr.
Perkin-Elmer Corp.
Norwalk, Connecticut 06852 (USA)
- 1967– SHIMANOCHI, T., Prof.
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I.5.3 SUB-COMMISSION ON MASS SPECTROSCOPY

Members

(to be appointed)

Titular Members*Chairman*

- 1965–1973 EVERETT, D. H., Prof.
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- 1967–1975 VAN OLPHEN, H., Prof.
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- 1969–1973 KAZANSKY, V. B., Dr.
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- 1971–1975 KEMBALL, C., Prof.
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Associate Members

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- 1969- FRIBERG, S., Dr.
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- 1969- KISELEV, A. V., Prof.
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Leninskii Prospect 14, Moscow V-71 (USSR)
- 1969- LANGE, H., Prof.
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- 1969- SCHUIT, G. A., Prof.
Technische Hogeschool
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- 1967- SHELUDKO, A., Prof.
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- 1971- TAMARU, K., Prof.
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1972- MORIKAWA, K., Dr.
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- United Kingdom*
1971- RIDEAL, Sir ERIC
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DIVISION COMMITTEE

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Vice-President

- 1959–1973 GUTMANN, V., Prof.
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- 1969–1975 MALATESTA, L., Prof.
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- 1965–1975 COLLONGUES, R., Prof.
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- 1969–1973 GREENWOOD, N. N., Prof.
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- 1969–1973 HORTON, W. S., Dr.
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- 1971–1975 MAGNÉLI, A., Prof.
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- 1971–1975 SWINARSKI, A., Prof.
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- 1971–1975 VLČEK, A., Prof.
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- 1971–1975 YAMASAKI, K., Prof.
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- 1963–1973 GREENWOOD, N. N., Prof.
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Secretary

- 1967–1975 PEISER, H. S., Mr.
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- 1969–1973 CAMERON, A. E., Dr.
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- 1967–1975 FUJIWARA, S., Prof.
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- 1971–1975 JOHNSON, W. H., Prof.
Department of Physics, University of Minnesota
Minneapolis, Minnesota 55455 (USA)
- 1971–1975 MEINKE, W. W., Dr.
Analytical Chemistry Division, National Bureau of Standards
US Department of Commerce
Washington, DC 20234 (USA)
- 1969–1973 ROTH, E., Prof.
Commissariat à l'Énergie atomique, Centre d'Études nucléaires
de Saclay
BP 2, F-91 Gif-sur-Yvette (France)
- 1971–1975 SMALES, A. A., Dr.
Analytical Sciences Division, Building 551, Atomic Energy
Research Establishment
Harwell, Didcot, Berkshire (UK)

Associate Members

- 1971– DE BIÈVRE, P., Dr.
Commission des Communautés européennes, Bureau central de
Mesures nucléaires
B-2460 Geel (Belgium)
- 1967– FLEROV, G. N., Prof.
Joint Institute for Nuclear Research
Dubna, Moscow (USSR)
- 1971– HOLDEN, N. E., Dr.
Knolls Atomic Power Laboratory
1 River Road, Schenectady, New York 12305 (USA)

- 1967- SVEC, H. J., Prof.
Institute for Atomic Research and Department of Chemistry
Iowa State University
Ames, Iowa 50010 (USA)
- 1971- THODE, H. G., Dr.
President's Office, McMaster University
Hamilton, Ontario (Canada)
- 1971- WAPSTRA, A. H., Prof.
Instituut voor Kernfysisch Onderzoek
Ooster Ringdijk 18, Amsterdam O (Netherlands)

Titular Members*Chairman*

- 1963–1973 FERNELIUS, W. C., Prof.
Department of Chemistry, University of South Florida
Tampa, Florida 33620 (USA)
(TEL: 813 974 2571)

Vice-Chairman

- 1949–1973 JENSEN, K. A., Prof.
Kemisk Laboratorium II, H.C. Ørsted Institutet
Universitetsparken 5, DK-2100 København Ø (Denmark)
(TEL: 353133)

Secretary

- 1963–1973 PRUE, J. E., Dr.
Department of Chemistry, University of Reading
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Members

- 1967–1975 ADAMS, R. M., Prof.
Geneva College
Beaver Falls, Pennsylvania 15010 (USA)
- 1971–1975 BERTELLO, L. F., Prof.
Perú 420, Accassuso, Buenos Aires (Argentina)
- 1971–1975 BUSCHBECK, K. C., Dr.
Gmelin-Institut
Carl-Bosch-Haus, Varrentrappstrasse 40-42, D-6000 Frankfurt/
Main 90 (Germany)
- 1959–1973 CHATT, J., Prof.
Agricultural Research Council Unit of Nitrogen Fixation
University of Sussex
Brighton BN1 9QJ (UK)
- 1971–1975 JEANNIN, Y., Prof.
Département de Chimie inorganique, Faculté des Sciences de
Toulouse
38 rue de 36-Ponts, F-31 Toulouse (France)
- 1971–1975 MYASOEDOV, B., Dr.
Radiochemical Laboratory, V.I. Vernadskii Institute of
Geochemistry and Analytical Chemistry, Academy of Sciences
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Vorobyevskoye chaussée 47-a, Moscow V-334 (USSR)

Associate Members

- 1969– ERDEY-GRÚZ, T., Prof.
Institute of Physical Chemistry, L. Eötvös University
Puskin utca 11-13, Budapest VIII (Hungary)

- 1971- HOLLIDAY, A. K., Prof.
Department of Inorganic, Physical, and Industrial Chemistry
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POB 147, Liverpool L69 3BX (UK)
- 1971- LEIGH, G. J., Dr.
Agricultural Research Council Unit of Nitrogen Fixation
University of Sussex
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- 1969- POWELL, W. H., Dr.
Chemical Abstracts Service, Ohio State University
POB 1378, Columbus, Ohio 43210 (USA)
- 1971- SCHÄFFER, C., Dr.
Kemisk Laboratorium II, H.C. Ørsted Institutet
Universitetsparken 5, DK-2100 København Ø (Denmark)
- 1969- VLČEK, A., Prof.
Polarografický Ústav J. Heyrovského, Československá
Akademie Věd
Vlašská 9, Praha 1 (Czechoslovakia)
- 1969- WEISS, E., Prof.
Institut für Anorganische Chemie der Universität Hamburg
Papendamm 6, D-2000 Hamburg 13 (Germany)
- 1969- YAMASAKI, K., Prof.
Department of Chemistry, Faculty of Science, Nagoya
University
Chikusa-ku, Nagoya 464 (Japan)

II.2.1 SUB-COMMISSION ON ORGANIC DERIVATIVES OF THE ELEMENTS

Convenor

- 1963- CHATT, J., Prof.
Agricultural Research Council Unit of Nitrogen Fixation
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Members

- 1972- CROSS, L. C., Dr.
Chemical Society
Burlington House, Piccadilly, London W1V 0BN (UK)
- 1963- JENSEN, K. A., Prof.
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Universitetsparken 5, DK-2100 København Ø (Denmark)
- 1965- LOENING, K. L., Dr.
Chemical Abstracts Service, Ohio State University
POB 1378, Columbus, Ohio 43210 (USA)
- 1963- LOZAC'H, N., Prof.
École nationale supérieure de Chimie, Université de Caen
5 avenue d'Edimbourg, F-14 Caen (France)
- 1971- PRUE, J. E., Dr.
Department of Chemistry, University of Reading
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Titular Members*Chairman*

- 1965–1973 HORTON, W. S., Dr.
Inorganic Materials Division, National Bureau of Standards
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Secretary

- 1969–1973 RIECK, G. D., Prof.
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Members

- 1969–1973 ALCOCK, C. B., Prof.
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Toronto 5, Ontario (Canada)
- 1965–1973 COLLONGUES, R., Prof.
Chimie minérale appliquée, École nationale supérieure de Chimie
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- 1969–1973 FITZER, E., Prof.
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- 1969–1973 SHEINDLIN, A. E., Prof.
Institute for High Temperatures, Academy of Sciences of USSR
Ul. Krasnokazarmennaya 17, Moscow E-250 (USSR)

Associate Members

- 1965– CABANNES, F., Prof.
Centre de Recherches sur Physique des Hautes Températures
Centre national de la Recherche scientifique
F-45 Orleans, La Source (France)
- 1969– HLAVÁČ, J., Prof.
Katedra Technologie Silikátů, Vysoké Školy Chemicko-
Technologické v Praze
Technická 1905, Praha 6-Dejvice (Czechoslovakia)
- 1969– DE MARIA, G., Prof.
Istituto di Chimica, Fisica e Elettochimica
Citta Universitaria, Università, Roma (Italy)
- 1969– MII, H., Prof.
Department of Mechanical Engineering, Nagoya University
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- 1969- MOTZFELDT, K., Prof.
Metallurgisk Institutt, Norges Tekniske Hogskole
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- 1969- NOWOTNY, H., Prof.
Institut für Physikalische Chemie der Universität Wien
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National Representatives

- Australia* McCARTNEY, E. R., Dr.
1969- Department of Ceramic Engineering, University of New South
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- Belgium* DROWART, J., Prof.
1969- Laboratoire de Chimie Physique moléculaire, Université libre de
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50 avenue F.D. Roosevelt, B-1050 Bruxelles
- Canada* BRIGHT, N. F., Dr.
1970- Department of Energy, Mines, and Resources
555 Booth Street, Ottawa, Ontario
- India* ATMA RAM, Dr.
1970- Council of Scientific and Industrial Research
Rafi Marg, New Delhi-1
- Italy* COLOMBO, U., Prof.
1971- Società Montecatini Edison
Istituto Donegari, Novara
- Poland* MROWEC, S. T., Prof.
1970- Instytut Chemii Ciała Stałego, Akademia Górniczo-Hutnicza im
Stanisława Staszica w Krakowie
Aleja Mickiewicza 30, Kraków
- Sweden* MAGNÉLI, A., Prof.
1969- Institutionen för Oorganisk och Fysikalisk Kemi, Stockholms
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POB 6801, S-113 86, Stockholm 6
- United Kingdom* STEELE, B. C. H., Dr.
1970- Department of Metallurgy, Imperial College of Science and
Technology
South Kensington, London SW7 2AY
- United States of America* CUBICCIOTTI, D. D., Dr.
1970- Stanford Research Institute
Menlo Park, California 94205

III ORGANIC CHEMISTRY DIVISION

DIVISION COMMITTEE

President

- 1961–1973 OURISSON, G., Prof.
Institut de Chimie, Université Louis Pasteur Strasbourg
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Past-President

- 1963–1973 BARTON, D. H. R., Prof.
Department of Chemistry, Imperial College of Science and
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Vice-President

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Secretary

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- 1965–1973 HEROUT, V., Prof.
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- 1969–1973 NAKAJIMA, M., Prof.
Department of Agricultural Chemistry, College of Agriculture
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- 1971–1975 OVCHINNIKOV, Yu. A., Prof.
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Ul. Vavilova 32, Moscow V-312 (USSR)
- 1969–1973 ROMO, J., Prof.
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- 1971–1975 WILKE, G., Prof.
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- 1971- HEUSSLER, K., Dr.
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- 1971- MATHIEU, J., Dr.
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- 1971- SIMMONS, H. E., Dr.
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III.1 COMMISSION ON NOMENCLATURE OF ORGANIC CHEMISTRY

Titular Members

Chairman

- 1953–1975 LOZAC'H, N., Prof.
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- 1971–1975 BLÁHA, K., Dr.
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- 1965–1973 CROSS, L. C., Dr.
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- 1971–1975 KLYNE, W., Prof.
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- 1965–1973 LOENING, K. L., Dr.
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- 1967–1975 RIGAUDY, J., Prof.
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- 1949–1973 VEIBEL, S., Prof.
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- 1969-1973 OSER, B. L., Dr.
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- 1972– STONE, L., Dr.
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- 1971- MARTINEZ-MORENO, J., Prof.
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- Switzerland* BRÜGGER, H. U., Dr.
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STANDING ORDERS OF EXECUTIVE COMMITTEE REGARDING FINANCE COMMITTEE

Composition and Terms of Office

- (i) There shall be a standing Finance Committee composed of five Members and a Chairman. In addition, the Treasurer will be an ex-officio Member but without voting power.
- (ii) The President in consultation with the Executive Committee shall appoint Members. The Finance Committee may propose names of persons suitably qualified for appointment.
- (iii) The maximum period of service of Members shall be eight years.
- (iv) In order to ensure continuity, Members shall be replaced at two-year intervals, beginning in 1971, alternately two Members and one Member.
- (v) The President in consultation with the Executive Committee shall appoint the Chairman. The Finance Committee may propose candidates.
- (vi) The period of service of the Chairman shall not exceed eight years. The sum of the years of service as a Member and as Chairman shall not exceed ten years.

Terms of Reference

- (i) It shall be the duty of the Finance Committee to advise the President and the Executive Committee on financial matters.
- (ii) Decisions with respect to the Finance Committee's recommendations shall be made by the President and/or Executive Committee.
- (iii) The Finance Committee shall not have executive functions except with respect to dealings in securities. The Finance Committee shall have executive authority with respect to selection, purchases, and sales of securities held by IUPAC, provided that the Treasurer and the IUPAC Banker concur with the decisions of the Finance Committee.
- (iv) The Finance Committee shall review the IUPAC investment portfolio at least annually and make such changes as appear appropriate.

LIST OF ABBREVIATIONS

ACS	American Chemical Society
AGARD	Advisory Group for Aeronautical Research and Development (NATO)
AOAC	Association of Official Analytical Chemists
ASTM	American Society for Testing and Materials
BIPM	Bureau International des Poids et Mesures
CBN	IUPAC-IUB Commission on Biochemical Nomenclature
CEE	Communauté Européenne Economique
CGPM	Conférence Générale des Poids et Mesures
CIOMS	Council for International Organizations of Medical Sciences
CIPM	Comité International des Poids et Mesures
CODATA	ICSU Committee on Data for Science and Technology
COWAR	ICSU Scientific Committee on Water Research
CQUCC	IUPAC Commission on Quantities and Units in Clinical Chemistry
FAO	UN Food and Agriculture Organization
FATIPEC	Fédération d'Associations de Techniciens des Industries des Peintures
FDA	US Food and Drug Administration
FIP	Federation International Pharmaceutique
FSPT	US Federation of Societies of Paint Technology
IAB	ICSU Abstracting Board
IAEA	International Atomic Energy Agency
IAPT	International Association of Plant Taxonomy
IARC	WHO International Agency for Research on Cancer
IAWPR	International Association on Water Pollution Research
ICC	International Association for Cereal Chemistry
ICSU	International Council of Scientific Unions
ICTA	International Confederation for Thermal Analysis
IFCC	International Federation of Clinical Chemistry
IOACh	International Office for Analytical Chemistry
IOC	International Organization of Chemosystematics
IOPB	International Organization of Plant Biosystematists
ISHC	International Society of Heterocyclic Chemistry
ISO	International Organization for Standardization
ISO/TC	ISO Technical Committee
ISO/TC SC	ISO/TC Sub-Committee
ISQB	International Society of Quantum Biology
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences
IUCr	International Union of Crystallography
IUCS	Inter-Union Commission on Spectroscopy
IUFST	International Union of Food Science and Technology
IUNS	International Union of Nutritional Sciences
IUPAB	International Union of Pure and Applied Biophysics
IUPAP	International Union of Pure and Applied Physics
IUPS	International Union of Physiological Sciences
NAS-NRC	US National Academy of Sciences—National Research Council
NBS	US National Bureau of Standards
NPL	UK National Physical Laboratory
OCCA	UK Oil and Colour Chemists' Association
OECD	Organization for Economic Cooperation and Development

OSTI	UK Office of Scientific and Technical Information
PAG	Protein Advisory Group of FAO/WHO/UNICEF
SAC-AMC	UK Society for Analytical Chemistry—Analytical Methods Committee
SCI	UK Society of Chemical Industry
SCOPE	ICSU Special Committee on Problems of the Environment
SI	Système International
SLF	Federation of Scandinavian Paint and Varnish Technicians
SUN	IUPAP Commission for Symbols, Units and Nomenclature
TNO	Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (Netherlands Organization for Applied Scientific Research)
TAPPI	US Technical Association of Pulp and Paper Industry
UN	United Nations
UNESCO	UN Educational, Scientific and Cultural Organization
UNICEF	UN Children's Fund
UNIDO	UN Industrial Development Organization
UNISIST	ICSU-UNESCO Joint Project to study the Feasibility of a World Information System
USDA	see FDA
WHO	UN World Health Organization

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